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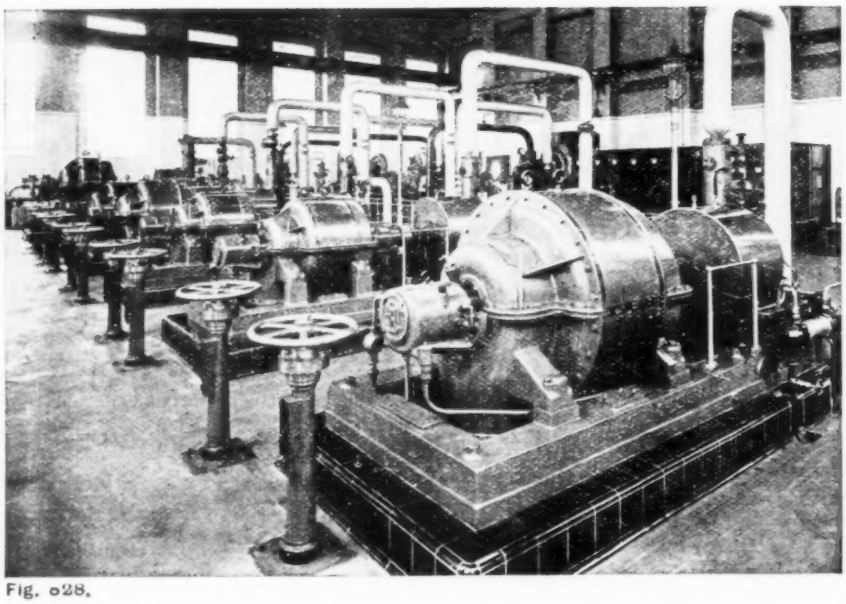

Fig. 028.

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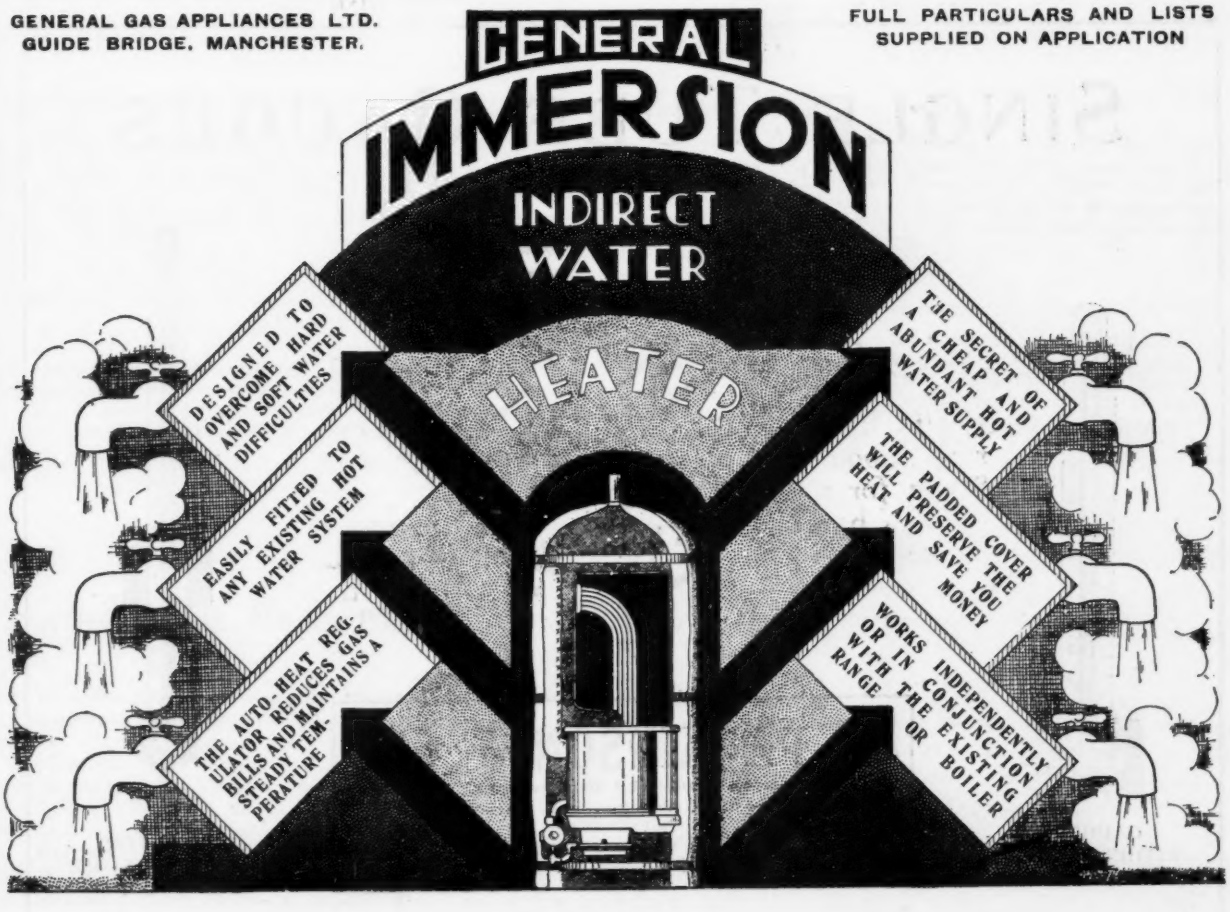
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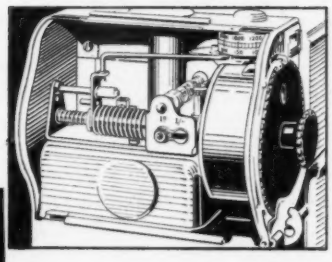

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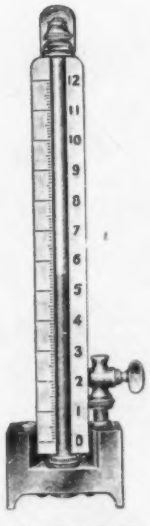

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THE GAS JOURNAL

DECEMBER 21, 1932

Vol. 200 84th Year No. 3631

A Glance at the Contents—

Domestic Water Heating by Gas.

Mr. W. B. Payne, of Liverpool, discussed this subject before the Manchester and District Junior Gas Association. [p. 807.]

National Gas Council.

A Meeting of the Central Executive Board of the National Gas Council was held at 28, Grosvenor Gardens, S.W. 1, on Tuesday, Dec. 13—Sir David Milne-Watson, LL.D., D.L., in the chair. [p. 796.]

Scientific Investigation and Utilization of Gas.

In his Presidential Address before the Yorkshire Junior Gas Association at Leeds on Dec. 10, Mr. J. W. Wood deals with the relation of scientific investigation to the successful utilization of town gas, with special reference to domestic gas, which still forms the major portion of the load in most areas. [p. 802.]

Scientific Control of Carbonization.

It has been the endeavour of the Dundee Gas Department to bring the carbonizing plant up to a high degree of efficiency through the introduction of up-to-date apparatus for checking and recording results, which are referred to by Mr. J. Duffy in a paper before the Scottish Junior Gas Association (Eastern District). [p. 805.]

Deputy Gas Engineer and Manager Required.

The Burnley Corporation invite applications for this position, for which they offer a salary of £400 per annum rising by two annual increments of £25 to £450. [p. 813.]

Catalytic Oxidation of Organic Compounds in the Vapour Phase.

This book, by L. F. Marek and Dr. Dorothy A. Hahn, published by the Chemical Catalog Company, Inc., of New York, is comprehensively reviewed by Mr. E. W. Muddiman, B.Sc., F.I.C. [p. 798.]

Exhibition Houses.

In an interview, Mr. J. Sandon Stubbs, Secretary and Treasurer to the Liverpool Gas Company, sums up the advantages of exhibition houses, fully equipped with gas apparatus, and explains why his Company are participating in another exhibition house at the present time—the fourth within seven months. [p. 799.]

Testing of Gas Fittings and Meters.

To continue to hold the confidence of the public, it is necessary that all appliances and fittings should pass a standard test, in excess of what they are usually guaranteed to do, states Mr. Blackhall, in outlining to the Scottish Junior Gas Association (Eastern District) the testing work carried out at Edinburgh. [p. 806.]

Forthcoming Engagements

Jan. 12.—MIDLAND JUNIOR ASSOCIATION.—Meeting in Birmingham. Paper by Mr. H. Smith.

Jan. 14.—SCOTTISH JUNIOR ASSOCIATION.—Joint Meeting in Glasgow. Address by Mr. C. Valon Bennett.

Jan. 14.—WESTERN JUNIOR ASSOCIATION.—Meeting at Exeter. Paper by Mr. D. L. Copp.

Jan. 19.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council Meeting at 2.30 p.m.

Jan. 21.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Halifax. Paper by Mr. J. Bradbury.

Jan. 27.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. P. Wedgwood.

1932 "JOURNAL" Directory.

Page 64. STALYBRIDGE. Mr. R. J. Restall appointed Engineer and Manager, vice Mr. W. Hill, retired.

EDITORIAL NOTES

Science and Gas Combustion

THE outstanding feature of the Gas Industry's activities since the war has been the increasing application of science to the utilization of gas, and there are signs that the importance of investigation into the problems of satisfactory gas usage will in the near future be appreciated as it ought to be. In regard to past work on the subject, Mr. J. W. Wood outlines in our columns to-day some of the investigations with which he has been concerned in his capacity as Research Chemist to the Joint Committee of the Institution of Gas Engineers and Leeds University. The period he reviews is from 1917 to the present, and there can be no shadow of doubt that the researches undertaken have helped to place the Industry in a position to offer appliances, relatively cheap, which meet modern requirements of safety and hygiene. To read Mr. Wood's account is to realize how vastly the outlook of the Gas Industry has changed since the passing of the Gas Regulation Act—the "Gas Consumers' Charter"—in 1920.

Mr. Wood confines himself to work undertaken by the Joint Research Committee, which has resulted in a wealth of independent and authoritative information. Side by side with this work we have had ever-increasing assistance from the manufacturers of appliances and ever-increasing efficiency in the research organizations of individual gas undertakings. It is a fact that co-operation was never so strong as now; and this co-operation enables us to face the future with confidence and enthusiasm. The utilization of gas has definitely ceased to be a hit-and-miss business. Appliances are now being marketed which combine first-class engineering skill, scientific principle, and modern finish; these appliances render gas a modern medium of energy. Of all the researches undertaken, none is of greater importance than the fundamental study of the combustion of town gas. The knowledge gained in this connection during recent years has wrought a transformation in the design and safe fitting of apparatus for heating and water heating, and has played a major rôle in the successful application of thermostatic control—one of the most important of modern developments. It has also had its effect in increasing the efficiency of gas lighting.

The observations of Mr. Wood on aeration are of much significance, and should be read carefully. They certainly reinforce our impression that as time passes we shall see fewer and fewer air-gas ratio "adjusters." A fixed air port and a size of gas injector appropriate to the particular conditions of supply will become more the order of the day. Remarking on the Joint Committee's tests on gas quality, Mr. Wood states that "it is highly probable that greater efficiencies might have been obtainable with some of the grades of gas if they had been burned in appliances specially designed for their utilization. This is a field in which comparatively little work has been done, and it may well repay engineers to 'tune-up' standard gas appliances and make trifling structural alterations in order to utilize local gas supplies to the very best advantage." To our mind a great deal of this "tuning-up" could be accomplished by concentration on a fixed air-gas ratio.

In this connection we call attention to what Mr. Wood has to say about aeration. In practice, a quantity of air somewhat in excess of the "theoretical air requirement" must be supplied to secure complete combustion. "It is surprising how small this excess need be under favourable conditions. In the case of the atmospheric burner the total amount of air is supplied partly as 'primary' air and partly as 'secondary' air, and designers are continually striving to produce burners in which the degree of primary aeration shall approach as nearly as possible to the theoretical air requirement of the gas, believing that combustion under such conditions must be more complete and more efficient than that obtained in existing types of burners. Of the truth of this assumption I have yet to be convinced." This gives an adequate working margin for the fixed air port and fixed gas injector.

Hydrogenation

IMPORTANT correspondence and comment on the hydrogenation of coal for the production of petrol has been taking place in "The Times." The ball was set rolling by Mr. H. T. Tizard, Rector of the Imperial College of Science and Technology, who made a careful analysis of the problem and put forward pertinent questions. His views may best be summed up by the following quotation: "Is it really wise, at a time when there is general agreement that serious troubles are caused by the over-production of one of these materials, to contemplate adding to the over-production of one of these materials by methods which are demonstrably uneconomic?" Mr. Tizard regards the problem purely from the point of view of economic policy. It is generally recognized that first-class petrol can be obtained from coal; the technical difficulties have, in fact, been very largely solved. It is a question of the price at which this petrol can be made; and a figure of 9d. per gallon is advanced on the basis of a plant which would cost not less than £7,000,000 and which would treat continuously at full capacity 800,000 tons of coal a year, producing 200,000 tons of petrol. And the life of the plant would have to be not less than ten years.

This figure of 9d. per gallon applies to a plant on a particular site, and Mr. Tizard doubts whether other sites would offer the same facilities for low cost of production. However, at 9d., home-produced petrol would have an advantage of about 4d. a gallon, provided the present duty of 8d. a gallon on imported spirit were to be stabilized, and no Excise duty were to be levied. The point must be borne in mind that, in so far as hydrogenated spirit succeeds in displacing imported spirit, the Revenue will lose the amount of the import duty, and what eventual loss is incurred will have to be made up by taxation. We say "eventual loss" because large-scale hydrogenation would increase employment, though

Hearty Christmas Greetings to All

Mr. Tizard regards the effect as negligible, maintaining that not more than 5000 men would be employed directly or indirectly by a plant capable of producing 200,000 tons of petrol a year.

Admittedly Mr. Tizard does not deal with the national aspect of the problem—the desirability of safeguarding a supply of oil, a matter of real importance to National defence; or the psychological effect of assisting in any measure our basic industry. We are all out to do what is possible to help the coal industry; and in this direction the influence of the Gas Industry is sadly neglected. The Gas Industry offers something of great National interest—an economic form of energy suited to modern ideas of comfort and hygiene, produced by the most efficient known method of treating raw coal. Increased use of gas and of the bye-products of carbonization, including benzole, has a direct effect in increasing employment in the mines. While the problem of hydrogenation is under consideration there is at hand a potent means of staying the inroads of imported oil. There are, for example, many industrial processes today being carried out by oil which could equally well be served by gas. It would definitely help the coal industry and the nation generally if more sympathy were extended to the Gas Industry and there was greater appreciation of its powers of service. The future of the coal industry is largely bound up with the expansion of the use of gas and electricity.

Again, when the subject of hydrogenation is under consideration it must not be forgotten that oils produced from coal offer a far more suitable raw material for the process than is offered by coal.

Mr. Clarry's Suggestion

Mr. Reginald G. Clarry, while accepting Mr. Tizard's data, argues in favour of the formation of a company with Parliamentary powers to acquire and operate the patent rights in a unit capable of producing 200,000 tons of petrol per annum—*i.e.*, one-twentieth of our requirements. The £7,000,000, he suggests, should be publicly subscribed, the dividend being fixed, and the retail price of petrol maintained at the same price as imported petrol by adjustments between import and Excise duties. The Government would be required to undertake that during ten years the duty charged on imported petrol would not be less than 6d. per gallon, and would also undertake to assess only such Excise duty on the home-produced petrol as would make up the difference between the home cost of production and the wholesale price of imported petrol. This, on Mr. Tizard's figures, would in the case of the former be 9d. *plus* 4d. Excise duty, competing with imported petrol at 5d. *plus* 8d. import duty.

"On this basis," says Mr. Clarry, "the Government would not realize the revenue of 4d. per gallon on 200,000 tons, which equals £1,000,000. Set against this reduction in revenue would be the saving in keeping 5000 out of work employees—mostly miners—at an average cost of £72 per man per annum, or £360,000, the actual net reduction being £640,000 on a unit of 200,000 tons of petrol. . . . There would appear to be something to be said for a first unit trial, and if it was found in two years' time when the unit was in production that we could not afford the loss of £640,000 revenue, then a further 1d. per gallon import duty on the nineteen-twentieths, bringing in £4,750,000, might console our hard-pressed Exchequer."

The Housing Bill

There was an interesting debate in the House of Commons last week, when there was read a second time, and referred to a Committee of the whole House, the Housing Bill which, following the Rent Restriction Bill, is the second and final instalment of the measures for adjusting housing policy to the changing conditions. This Bill holds out promise of developments in which the Gas Industry should play an important part, and we feel sure that the fullest advantage will be taken of all opportunities that may offer themselves. The tenants will be aware of all the services that gas is so eminently suited to render in dwellings of the type contemplated, and there must be freedom to enjoy them.

It was pointed out by the Minister of Health (Sir E. Hilton Young) that the gravity of the housing problem lay, not in the supply, but in the distribution of the supply between the classes of houses. There are more better-class houses than are required, and not enough of the type of house to meet the demand of lower-paid wage-earners—the non-parlour house with three bedrooms. The object of the subsidy system was to provide houses of that type which could be let at a weekly rent of 7s. 9d., exclusive of rates, or 9s. 9d., inclusive of rates. The building cost of a house of this character, in the September quarter of 1930, was £351. In 1931 the figure was £333, while this year—due to the great fall in the price of money or the return on capital—it had fallen to £295, taking the average of the country as a whole. It was, he pointed out, unreasonable to expect unaided private enterprise to prevail against subsidized competition, and if they wished to promote the supply of houses at the present time the most obvious course to take was the total withdrawal of the subsidy. It was felt that, on the withdrawal of the subsidy, houses would be built in very large numbers to supply the whole demand shown by the waiting list of the local authorities, and that this building would continue until there was a margin of vacant houses comparable with that which existed before the war.

The Building Societies are to be encouraged to find money to finance the houses, and the Minister of Health urged that it was a reasonable proposition for the Government to enter into the guarantee details of which are set out in the Bill.

Electricity Supply Figures

"There has been a widespread extension of the distribution areas since the war, and practically the whole of Great Britain is now covered by supply powers, with a corresponding increase in the obligations of, and opportunities open to, the supply industry. Experience has shown, however, that the public can only be catered for in an adequate manner by foresight and enterprise on the part of the undertakers in providing suitable distribution networks, facilities for the wiring and equipment of premises to enable the fullest use to be made of electricity, in offering attractive two-part tariffs more particularly for domestic supplies, and by effective propaganda and publicity." How much—or rather how little—of this latter sentence requires either alteration or deletion to make it applicable to our own Industry? Foresight and enterprise—effective propaganda and publicity—are not the need of one branch of public utility alone, and exactly the same may be said of a tariff system designed to meet present-day conditions.

The quotation with which this note opens is taken from the twelfth annual report of the Electricity Commissioners, dealing with the twelve months to March 31 last, and it is not the only matter of interest to the Gas Industry which the report contains. Whether we like it or whether we like it not, there is no returning to the placid times of yore. Electricity is with us, and electricity will remain with us; so that we shall gain nothing by belittling it. Rather do we stand to gain from a full appreciation of the position. While in the twelve months reviewed the undertakings in the regional areas of Central Scotland and North-East England again showed a decline in output (although smaller than the decline in the previous year), the operations of the undertakings in the remaining portions of Great Britain showed a gross increase in output (units generated) of about 641 million units, or an increase of about 6·9% on the output in the same portions of the country in the previous year. Even when allowance is made for the falling off of about 104 million units in the output in Central Scotland and North-East England, the electricity supply industry was still able to show the substantial net increase in output of 537 million units, representing a growth of nearly 5% on the output in the previous year. During each of the past two years of abnormal depression in industrial conditions the supply industry has thus

shown an expansion of output at the rate of over 500 million units per annum.

In place of an annual increase of between 400 and 500 million units in the sales of electricity for power purposes, the supply industry experienced an actual decline of 37 million units in the sales for power purposes in 1930-31, as compared with the sales for 1929-30, and it is thought probable that when the detailed figures for 1931-32 become available there will be found a further decline in the sales for power purposes in that year also. As contrasted, however, with the fluctuations which have occurred in the rate of growth of the power load since 1920-21 under the influence of the varying industrial conditions which have prevailed, there has been a steady and progressive advance in the domestic load throughout the past twelve years, and also in the total amount of new load and number of new consumers connected annually to the public supply systems.

In the ten years up to 1930-31 the annual sales of electricity by authorized undertakers increased from 3512 million units to 9074 million units—namely, by upwards of 5560 million units, or an average increase of 556 million units per annum. There has been an all-round increase of over 84% in the amount of electricity produced per ton of coal and coke consumed for the purpose as compared with the position in 1920-21. On the basis of the 1931 Census of the total population of Great Britain—namely, 44,790,000 inhabitants—the sales of electricity from public sources of supply in that year represented an average consumption of approximately 210 units per head of population.

CORRESPONDENCE

Why Not "Coal Gas"?

SIR,—The concise Oxford Dictionary defines Gas as " any aeriform or completely elastic fluid (used chiefly of those that do not become liquid or solid at ordinary temperatures, other gg. being usu. called *vapours*); such fluid, esp. COAL-g. or various mixtures with carburetted hydrogen, used for lighting or heating; (Mining) explosive mixture of firedamp with air; hydrogen, &c., used to fill balloon; nitrous oxide g. as anæsthetic (often *laughing-gas*); (also *poison-g.*) kinds used to asphyxiate enemy in war; jet of g. used for lighting; empty talk, boasting, humbug, windbag eloquence; . . ."

In these days of proprietary articles and the systematic advertising of names, often invented to remain in the mind of the public—Bovril, Zip, Electrolux—it seems strange that the Industry has remained faithful to the one word "Gas" which means so much, and so little. Why not adopt the phrase "Coal Gas"? "Thank goodness for Coal Gas" is almost patriotic. Everyone realizes that coal is the basis of our national economy, and the addition of the word "coal" is bound to increase public goodwill.

Yours, &c.,
PAPHNUTIUS.

Dec. 14, 1932.

The 1933 B.I.F.

SIR,—I should be glad if you would allow me to thank publicly those who are exhibiting in the British Industries Fair at Castle Bromwich next February for the splendid manner in which they have co-operated with us in a space-economy movement which the phenomenal popularity of the Fair, here as in London, has forced upon us.

The number of applications received for exhibition space at the Birmingham section of the 1933 British Industries Fair is a most encouraging sign of the growing confidence in the trade outlook for Britain's "heavy" industries.

The Birmingham section has grown steadily year by year since 1920, when it was first organized. Extensions made for the 1932 Fair alone covered three acres and brought the total inside letting space to 250,000 sq. ft.—more than three times the space occupied in 1920. This year the demand for space has reached record proportions. Months in advance, every inch occupied at the last Fair was engaged for 1933, and still applications from prospective exhibitors have flowed in.

The main permanent exhibition building—one of the largest single halls in the country—at Castle Bromwich was filled to overflowing months ago. Re-arrangements of buildings and roofed outdoor display stands have been added to meet the pressure as far as possible.

Moreover, a number of exhibitors have, in the spirit of co-operation, agreed to "double up" and share their allotted area with others, for which the management would like publicly to record their appreciation.

The events of Ottawa resulted in increased interest in the Fair, and the fact that an increased number of leading manufacturers engaged in the heavy industries feel justified in making a new bid for world trade is a good indication of the belief of practical business men that trade winds are becoming more favourable to this country than they have been for a long time, and that the Fair is recognized as the most practical method of taking advantage of the improved tendency.

Yours, &c.,
C. E. GREENER,
Chairman.

British Industries Fair,
95, New Street, Birmingham,
Dec. 17, 1932.

Continuous Billing

SIR,—Although continuous meter reading and billing was not adopted by this Company when it installed in June, 1930, a machine for billing gas accounts, Mr. Carmichael may be interested to hear of our experience in Swansea in regard to the delivery, prior to the quarter day, of quarterly gas bills.

The machine billing system adopted permitted the dispatch of a bill within two or three days after the reading of the meter index, and as reading of the meter indices commenced the first week of the quarter month, it followed that the majority of the consumers received their bills prior to the quarter day.

Prior to the introduction of machine billing, bills had been dispatched in the month following the quarter month, and a certain number of consumers commented on the change. The receipt of the bill prior to the quarter day affected differently different consumers, but none proved difficult. A few were facetious, many were humorous, but the majority simply made reasonable inquiries.

The early delivery of subsequent issues of bills has not excited any comment, and the amount of payments made during the quarter month on the newly delivered bills is increasingly satisfactory.

It will be recognized, of course, that the conditions of the Swansea system are not fully comparable with those of a system of continuous meter reading and billing, under which some meters are read, and the bills delivered, on dates considerably in advance of the quarter day, and I may say that I still have the opinion which I expressed in my Address of May last, when I said that, in view of the machine equipment installed, the only system of continuous billing which had any appeal to me was monthly billing.

Yours, &c.,
ERNEST ABLETT.

Swansea Gas Light Company,
Dec. 10, 1932.

PERSONAL

NEW GAS ENGINEER AT STALYBRIDGE.

The value of Burnley as a stepping-stone to important positions in the Gas Industry is again evidenced in the appointment of Mr. Reginald J. Restall, Works Manager of the Oswald Street Gas-Works, to the post of Engineer and Manager to the Gas Department of the Stalybridge Corporation.

He is the third official from the Burnley Gas Department who has become a gas manager and engineer to other corporations.

Mr. Restall has been in Burnley, under Mr. J. H. Clegg, for four years, and was engaged as engineering assistant on the construction of the high-pressure gas main from Burnley to Altham. A native of Stansfield, near Todmorden, he removed to the South of England at an early age, and has since lived in Pindhoe, Northumberland, Grimsby, Hull, and Haslingden. Educated at the Grammar School, Dudley, he first served with Messrs. J. Thompson (Dudley and Wolverhampton), Ltd., General Engineers and Boilermakers, where he gained experience in the workshops, drawing office, and with the outside staff in the Manchester district.

Mr. Restall's articles were interrupted by the war, during which he joined the Worcestershire Regiment in September, 1914, and served four-and-a-half years. He was invalided home from France with dysentery and spent fifteen months in hospital and convalescent camp. After the war he returned to Messrs. Thompson, Ltd., and in August, 1920, was made junior assistant and draughtsman to the Stockport Corporation Gas Department under the late Mr. S. Meunier. He subsequently spent several years under Col. W. M. Carr, the Engineer and General Manager of the Stretford and District Gas Board, and was there responsible, as Resident Engineer to Col. Carr, for reconstruction of part of the works, involving a telpherage system for coal and coke handling, reinforced concrete foundations, house, and a complete bench of horizontal retorts with machinery and waste-heat boilers.

* * *

Sir FRANCIS GOODENOUGH has accepted the invitation of the Senate of the University of London to join the Governing Body of the School of Slavonic and East European Studies.

* * *

The Blackburn Gas Committee have recommended the appointment of Mr. J. D. ASHWORTH, Deputy Gas Engineer, to the position of Gas Engineer and Manager in succession to Mr. G. P. Mitchell, who leaves at the end of the year for Worcester. Mr. Ashworth went to Blackburn from Portsmouth in 1923, and has rendered excellent service to the Department.

OBITUARY

MR. C. W. JAMES.

The death took place on Tuesday, Dec. 13, at his residence, Glenera, Broadway, Morecambe, formerly of Clifton Road, Halifax, of Mr. Charles William James, who for 32 years had been actively connected with the firm of Messrs. Drakes, Ltd. He was 57 years of age and leaves a widow but no family.

Mr. James had not been well enough to attend at business since January last. Some three months ago he went to live in Morecambe in the hope that the change would prove beneficial.

A native of Northwich, he served his apprenticeship in the Gas Industry with West's Gas Improvement Company, Ltd., of Manchester, from there going to Messrs. Robert Dempster & Sons, Ltd., Elland. In 1900 he entered the service of Messrs. Drakes, Ltd., being appointed a Director in 1926, and last year he was appointed Chairman and Managing Director.

Prior to his declining health he devoted most of his time to business, his chief recreation being association football, of which he was formerly a keen supporter. He was a member of Halifax Town and Huddersfield Town football clubs.

The interment took place at Illingworth Methodist Cemetery, and was very largely attended, many well-known members of the Gas Industry being present.

THE NEWS OF THE WEEK

The Employees of the Newcastle-upon-Tyne and Gateshead Gas Company have raised by weekly subscriptions during the past year the sum of £988 13s. 3d. in aid of medical charities. About 40 medical charities have received donations from the fund.

Members of the Blackburn Gas Department have subscribed £86 10s. to the East Lancashire Workpeople's Hospital Fund, according to the annual report just issued, while the office staff contributed £10 8s.; Darwen Gas-Works, £26; and Clitheroe Gas-Works, £13 5s.

An Attractive Folder depicting in colour the usefulness of the modern gas fire for domestic heating purposes, and also the panel heater for entrance halls, passages, and garage heating, is being distributed to 70,000 quarterly consumers of the Newcastle-upon-Tyne and Gateshead Gas Company.

The Christmas Number of "The Flame," a gas bulletin published regularly by the Leicester Corporation Gas Department, is a very bright and seasonable publication, containing much of interest in regard to the domestic applications of gas, together with a number of useful recipes for the housewife.

A Fault in the Electricity Grid system in the West Riding, last week, resulted in a black-out at Keighley and Bingley for about half-an-hour just as the factories and offices were closing down for the evening. At Keighley the Corporation started up their local emergency plant to restore lighting service. The fault affected the Bradford generating station plant to some extent, causing the lighting service in that city to dim for a few minutes.

The South Molton Gas Committee reported to the Town Council at their meeting on Dec. 13 that they had considered two schemes prepared by the Manager of the gas-works—one for the provision of a 65,000 c.ft. gasholder costing £4670 and the other for increasing the storage capacity to 100,000 c.ft., together with other improvements, costing £5770, and recommended that the larger scheme be carried out. By a majority the Council adopted the Gas Committee's recommendation.

A London Story Told in Gas.

Gas Light and Coke Company's Propaganda.

As many of our readers will doubtless have observed, a very fine series of advertisements is being inserted in the National Press by the Gas Light and Coke Company. The theme of the first of these was "A London Story Told in Gas," and the arrangement of the layout was forceful and striking, and, furthermore, unlike many present-day advertisements, it had a moral; and a moral not only inspiring pride and confidence in those who read it but also providing a worthy standard both for the largest gas undertaking and for every gas undertaking to live up to—namely, "The Gas Light and Coke Company never lets London down."

In the centre of the layout was a consumption curve showing a typical day's demand for gas, and radiating from various points on this curve were lines leading to pictorial representations of the many different services that gas is rendering to the community, both domestic and industrial,

THE NEWS—continued.

throughout the day. To quote from the letter-press, which best explains the advertisement: "Getting up is the beginning, when millions of Londoners take for granted a hot bath, hot bacon, and the pleasant warmth of a gas fire.

"As people leave home for work, we prepare for our next rush. Quite apart from your homes, we are kept busy by offices and factories; modern industry has a thousand and one uses for gas. And so to lunch. Afternoons are quieter, and then come the 50,000 gas lamps in London streets, dining out for revellers, supper for stay at homes, and, at last, hot drinks and warm bedrooms for everyone. Good things all—and all depend on us.

"While London sleeps, we work on, making gas for tomorrow. Only gas can be stored centrally to meet a city's sudden needs for heat. An army of men, a fleet of ships, a mountain of coal, 5033 miles of mains serve this huge and sensitive machine for giving heat to London. At one moment hardly a tap turns, and, at the next, you all want us at once. We meet your quickly varying needs without waste or delay and with never a failure."

Such is the story told in this excellent piece of propaganda, which should prove as valuable to the Industry as a whole as to the Gas Light and Coke Company itself. But to appreciate the real force of the advertisement it must be seen; and it should do much to bring home to Londoners—and not only Londoners, but all consumers of gas who see it—how dependent they are on this fuel for their everyday needs without appreciating it. Other advertisements which are appearing in the series are devoted to various individual applications of gas, for example, to cite the theme of another—"Harley Street and the Hospitals Choose Gas."

Satisfactory Progress at Wigan.

"The first six months of the present financial year so far as the Wigan gas undertaking is concerned are the most satisfactory for many years," the Chairman of the Wigan Gas Committee told the December meeting of the Town Council. Although gas consumers had benefited by no less than £2103 owing to the reduction in the price of gas, there had been increased revenue. The small amount of the capital debt was in the neighbourhood of £47,000, and within the next five or six years the Gas Department would be free from debt.

Output had increased during the past three months by 1,250,000 c.ft., and the future of the Gas Department was very promising. The Department had spent £3479 on resetting retorts, electric telpher, and extension to telpher track. They had not had to borrow for that work; all those extensions had been paid for out of the reserve fund, which, although depleted to a considerable extent, still had a balance of no less than £2000.

Cookery Demonstration at Buxton.

A very successful series of cookery demonstrations was held in the Demonstration Room of Gas Service Buildings, Buxton, during the week commencing Nov. 28. The opening ceremony was performed by the Mayoress of Buxton, Mrs. J. Brindley, in a happy little speech, in which she identified herself with every effort being made to promote comfort in the home.

The Lecturess was Miss E. Sanderson (First Class Diplômée, N.T.S.E., Gold Medallist, U.C.F.A.), of Radiation Ltd., who carried out the demonstrations, using a "New World" gas cooker. Attendances broke all records, and at several of the sessions a number of people were unable to obtain admission as there was not sufficient room.

The cake baking competition proved extremely popular, 88 entries being received. The Mayoress presented the prizes to the successful competitors.

Improved Lighting in Acton.

At a recent meeting of the Acton Corporation Highways Committee the Borough Engineer reported that he had been in communication with the Gas Light and Coke Company in regard to a revision in street lighting charges. The length of The Vale at present lit by 31 gas lamps is approximately 1467 yards, and to continue the gas lighting from the London Midland and Scottish Railway bridge to the Ealing boundary, 34 additional lamps will be required.

The present annual cost of gas lighting in the Borough is £9606, and the Company offered to extend the present system of gas lighting in The Vale to the Ealing boundary, and, notwithstanding such additional lighting, to reduce the annual charge made to the Council from £9606 to £8486—a saving of £1129 per annum—providing the Council entered into a contract for ten years for the lighting of the whole of the Borough.

The Company further offered to convert all the existing 1-light lamps to 2-light "Bijou" superheater burners of modern design and submitted a reduced schedule of charges to form the basis of any further gas lighting the Council may desire, all charges as at present to be subject to a rise and fall clause based on the price of gas. The offer of the Gas Light and Coke Company was accepted.

A REWARD FOR ENTERPRISE

The Bournemouth Gas and Water Company have been holding, in conjunction with the Parkinson Stove Company, a series of cookery demonstrations. One week's lectures were at the new Moordown Showrooms, and our photograph was taken during one of the lectures there. The lectures proved so successful that a further week's demonstrations were arranged at Hamworthy and Upper Parkstone. Miss L. Parkyn, First Class Diplômée, was the Demonstrator, and the menus were arranged to include Christmas recipes. The latest Parkinson cooker, the "Calthorpe," was used throughout the series, and the Gas Company's enterprise has resulted in an appreciable increase in cooker sales.

Seasonable Demonstrations at Lytham and St. Annes.

The cookery demonstrations of seasonable Christmas fare, arranged by the Lytham St. Annes Corporation Gas Department, commencing on Monday, Nov. 28, and concluding on Saturday, Dec. 10, proved to be exceptionally popular.

For the first three days the demonstrations were given in the Ashton Pavilion, St. Annes, and were then transferred to the St. Annes Gas Showrooms for Dec. 8, 9, and 10. These were followed by three days at the Lytham Baths, Dec. 1 to 3, and then at the Lytham Gas Showrooms for the last three days of the fortnight.

Miss N. Longworth, the Radiation Lecturess, carried out the demonstrations in her usual professional style, and delighted her audience by cooking a complete Christmas dinner entirely in the "New World" oven at one "Regulo" setting and time. This always proves an attractive feature.

A Century of Gas in Monmouth.

The gas exhibition and cookery demonstrations, which were held at the Borough Court Hall, Monmouth, recently, were organized by the Monmouth Gas and Water Works Company, Ltd., to commemorate the fact that gas has been made and used in Monmouth without a break since 1829. Cookery demonstrations were arranged daily by Radiation, Ltd.

The opening ceremony was performed by the Mayor (Councillor Frank Elcock), when Mr. G. H. Powell (Chairman of the Monmouth Gas and Water Works Company, Ltd.) presided, supported by Mr. H. Matterface (Manager and Secretary), Messrs. M. H. Simmonds and F. Williams (Directors), Councillor Mrs. E. A. Jones, Mr. H. D. Madden (Engineer and Manager of the Cardiff Gas Light and Coke Company), Mr. J. H. Canning, O.B.E. (Engineer and General Manager of the Newport Gas Company), Mr. I. G. Jenkins (Engineer and Manager of the Abertillery Gas Company), Mr. T. Wilkson (Engineer and Manager of the Abercarn Gas Company), Capt. Rowlinson (Director of the Cinderford Gas Company), Mr. A. Goodes (Engineer, Manager, and Secretary of the Cinderford Gas Company and Director of the Coleford Gas Company), and Mr. W. T. Newton (Gas Engineer, London).

The Chairman said it was with much pleasure that he welcomed those present that afternoon to commemorate the use of gas in Monmouth for well over 100 years.

History of the Company.

According to one of the Company's old minute books, it was found that a lease on the gas-works of 99 years expired in 1928, and as far as they could trace, Monmouth was illuminated by gas in 1829. Gas had been supplied for over 100 years in Monmouth, during which time it had not once failed. The gas-works were purchased by the Company in 1839 from Mr. E. G. Halliwell, of Stroud. Their present Manager, Mr. H. Matterface, was appointed on Jan. 1, 1919, and during his period of office the sales of gas had increased over 100%.

In declaring the exhibition open, the Mayor said it was with much pleasure he did so, because he felt it was an enterprise in the right direction. It was nearly always enterprise that led to success. He hoped the exhibition would be a great success, not only to the Gas Company, but to the town in general.

The Chairman, on behalf of the Monmouth Gas and Water Works Company, presented the Mayor and Councillor Mrs. E. A. Jones respectively with a chromium plated tea set.

Mr. Malcolm Simmonds said it was with great pleasure that he introduced Mr. H. D. Madden to the gathering. He was Engineer and Manager of the Cardiff Gas Light and Coke Company, and was President of the Institution of Gas Engineers when that body visited Monmouth on June 15, 1928. They were very pleased to see him among them once again. He asked Mr. Madden, on behalf of the Monmouth Gas and Water Works Company, to present their Chairman (Mr. G. H. Powell) with a replica of the presentation made to the Mayor and Mrs. E. A. Jones.

In presenting the Chairman with a similar tea set, Mr. Madden said that Mr. Powell, in Monmouth, was a representative of the Gas Industry; and the Monmouth Gas Undertaking, although so far from London, had given a service of 100 years continuity to the inhabitants of the town.

Mr. J. H. Canning (Newport) supported the remarks of Mr. Madden, and said it was of interest to visit their historic and ancient borough, and an added pleasure to be present at the exhibition. He wished to congratulate the Company on the hundred years' service rendered to Monmouth, and he was quite sure that at the end of another hundred years the Company would still be rendering those services to the borough.

The exhibition was open daily from 10 a.m. to 9.30 p.m., and during the week the Monmouth Gas and Water Works Company floodlighted a residence in Agincourt Street, which was very effective.

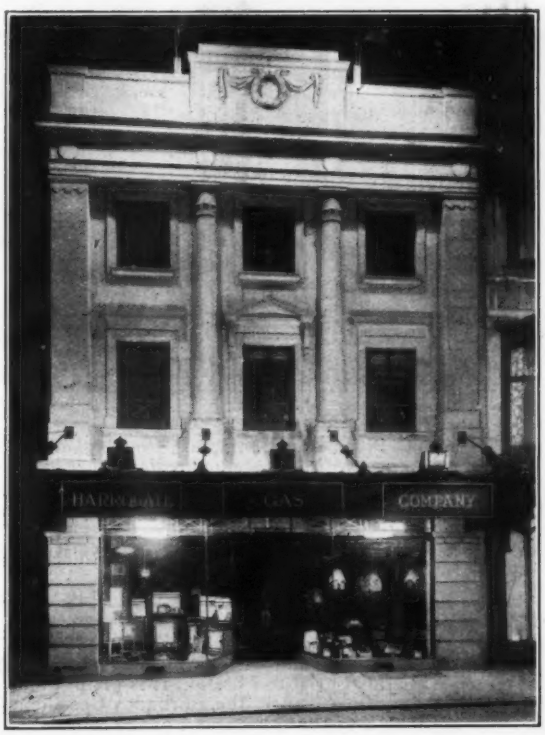
Gas Engineers at Monmouth.

Following the opening of the gas exhibition and cookery demonstrations recently in Monmouth, to commemorate the fact that gas had been supplied in the borough for over a hundred years, a party of well-known gas engineers who had been present at the ceremony, including Mr. H. D. Madden and Mr. J. H. Canning, paid a visit of inspection to the gas-works of the Monmouth Gas and Water Works Company.

After being welcomed by Mr. G. H. Powell, Chairman of the Directors, and Mr. Malcolm Simmonds (Director) they were conducted over the works by Mr. H. Matterface, the Engineer and Manager.

The party made a thorough inspection of the plant which has only recently been entirely renewed and modernized. Mr. Madden and Mr. Canning on behalf of the visitors afterwards congratulated the Company on the highly efficient state of their undertaking. The local gas-works, they said, was equipped with one of the most up-to-date plants of any they had seen in a town of the size of Monmouth. They also paid tribute to Mr. Matterface whose efficiency as an Engineer was well-known among his colleagues in the Industry.

Effective Advertisement.



[*Photo. by Thos. A. Cornall, Harrogate.*

A short time ago the shopkeepers in James Street, the principal shopping centre of Harrogate, agreed to have a scheme of floodlighting for the whole street for the month of December, to brighten the street for the Christmas shopping. They would not consider a scheme by gas lighting, and arranged for a number of electric lamps to be fitted by the local electricians. The Office of the Harrogate Gas Company is situated in this street, and as the Company could not support an all-electric scheme, they made their own arrangements, with the result shown by the above photograph, for which we are indebted to Mr. Frank H. Robinson, the Engineer and Manager.

THE NEWS—*continued.*

Gauging the Demand for Gas.

At a meeting of the Stratford-upon-Avon Gas Committee on Dec. 13, Alderman Ballance, presenting the minutes for confirmation, expressed the Committee's appreciation of a successful experiment carried out by Mr. F. Shewring, the Engineer and Manager, to provide a regulator which is automatically governed by the flow of gas into and out of the gasholder at Snitterfield.

Alderman Ballance pointed out that Snitterfield is four miles from the gas-works, and it was difficult to gauge correctly the demand for gas there. Sometimes the booster was at work when the gasholder was full. Accordingly the Gas Manager had fixed a contrivance which, when the holder was full, prevented any further gas entering, and when a certain quantity of gas had been drawn into the village it automatically opened. This was Mr. Shewring's own idea.

Railway Station Advertising.

Our photograph illustrates a new form of advertising by the Parkinson Stove Company, of Birmingham. The illuminated show-case is on the main departure platform at Paddington Station, and contains the firm's latest model "Calthorpe" gas cooker, with domed panel door—a feature recently introduced by the Parkinson Stove Company and referred to elsewhere in our editorial and advertisement columns to-day.

Giving.

If there is one thing more than anything else which is associated with this Christmas season, it is giving; and, we learn from a local newspaper, the Barbados Gas Company are entering with a will into the spirit of the season.

In the first place, during the past few weeks the Company have been offering a gift to the value of $15 to the first person to give a definite order for a gas cooking installation on an unpublished date—that is to say, the day on which this presentation will be made is known only to the Company and the local newspaper office.

There are, in addition, seven published dates on which the first persons giving orders for gas cooking installations will receive various gifts, including aluminium oven set (roaster and five pans, complete with covers); portable oven with glass door; kettle and aluminium kitchen tongs; six-pint aluminium square saucepan and spoon rest; a turkey; a plum pudding; a set of glass bowls; a measuring cup; and a cookery book. In a "gas cooking installation" the Barbados Gas Company include the supplying and fixing of any gas cooking appliance from a two-burner hot-plate upwards; and the useful gifts being offered should prove a valuable incentive to consumers and others to take advantage of the utility of gas as a cooking agent.

London County Council and Gas Bills.

The London County Council at its last meeting decided to present petitions against the following Private Bills in the Parliamentary session 1932-33 if it were found necessary to oppose them in the Council's interests. The Parliamentary Committee of the Council stated that they would report immediately after the Christmas recess when they were in a position to furnish detailed information of the extent to which the Council's interests might be affected: Commercial Gas, Gas Light and Coke Company, South Metropolitan Gas, South Suburban Gas.

Elland's Demonstrations of Christmas Dishes.

Some special Cookery Demonstrations of "dainty dishes for Christmas" were given in the Liberal Club, Elland, during the week ended Dec. 9.

Mr. J. Bridge, the Engineer and General Manager of the Elland-cum-Greetland Gas Company, opened the demonstrations with a few well-chosen remarks and announced that each member of the audience would receive a note-book and pencil, also a free Radiation Recipe Booklet.

At the conclusion of the demonstrations a vote of thanks was proposed to the Demonstrator—Miss D. Jaques (Diplômée, N.T.S.C. Cordon Bleu), of Radiation Ltd. As usual, a special feature was a dinner cooker entirely in the "New World" oven at one "Regulo" setting and at one time.

National Gas Council.

Meeting of Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council was held at 28, Grosvenor Gardens, S.W. 1, on Tuesday, Dec. 13—Sir DAVID MILNE-WATSON, LL.D., D.L., in the chair.

The late Sir Dugald Clerk.—Before proceeding with the business of the Meeting, the Chairman made sympathetic reference to the death on Nov. 12 of Sir Dugald Clerk, who at one time took a prominent part in the affairs of the Gas Industry, having been President of the Institution of Gas Engineers in the year 1920. It was reported that a letter of sympathy had been sent by the Council to the firm in which he had been a Partner, and also to his relatives.

Alderman Thomas Mitchell.—The Chairman, on behalf of the Board, congratulated Alderman Mitchell, who had been Chairman of the City of Stoke-on-Trent Gas Department for many years, and was now Vice-Chairman, on having succeeded to the position of Lord Mayor of Stoke-on-Trent.

Gas Legislation.—The position was reported with regard to the progress made by the Departmental Committee of the Board of Trade which was considering the proposals to amend existing Gas Legislation.

Bath (Gas) Special Order.—It was reported that, after a delay of nearly three years, the Bath (Gas) Special Order had now been approved, in effect, in the same form as that originally put forward by the Company, providing for multiple basic prices.

Multiple versus Single Basic Prices.—It was stated that the Joint Parliamentary Committee which had been appointed to consider this matter was meeting that day for the first time, and that the witnesses appearing on behalf of the Gas Industry were Mr. A. W. White (of Messrs. Cash, Stone, & Co.), Mr. George Evetts, Mr. A. Valon, and Mr. Wm. Cash (Vice-Chairman of the National Gas Council).

Development of Large-Scale Gas Supply for Industrial and Commercial Purposes.—It was reported that the Joint Committee consisting of representatives from the National Gas Council, the British Commercial Gas Association, and the Institution of Gas Engineers, had decided to summon a General Conference of all members of the three National Bodies, when certain proposals formulated by the Joint Committee would be submitted for the consideration of every gas undertaking.

Conjoint Conference of Public Utility Associations.—It was reported that the Constitution of the Conjoint Conference had now been adopted by all the constituent Associations, and representatives were appointed to represent the Council at the Annual General Meeting of the Conference,

which would take place on Jan. 25, 1933. Representatives were also appointed to serve upon the Council of the Conjoint Conference for the ensuing year.

Federation of British Industries.—Mr. Chas. F. Botley and Mr. Thos. Hardie were re-elected to serve as representatives on Main Group 9, Section 1, of the Grand Council for the ensuing year. Sir Francis Goodenough, Mr. H. C. Smith (Tottenham), and Mr. L. E. Clift (Redditch) were re-elected to serve as representatives on Main Group 14, Sub-Group 3 (Public Utilities) for the ensuing year.

Science Museum, South Kensington.—It was reported that a letter had been received from Mr. Thos. Hardie, the Council's representative upon the Advisory Council of the Science Museum, drawing attention to the increasing popularity of the museum to students engaged in Industry and urging that the advantages of the Museum should be brought more prominently to the notice of representatives of Gas Undertakings.

It was agreed that steps should be taken to carry out this suggestion.

Christmas Demonstrations at Dewsbury.

The series of Cookery Demonstrations recently organized by the County Borough of Dewsbury Gas Department, was entirely successful, and the Gas Department is to be congratulated on making them " demonstrations of Christmas fare."

Miss D. J. Baker (First-Class Diplômée, N.T.S.C.), of Radiation Ltd., carried out the demonstrations with her usual skill, and the roast turkey, Christmas pudding, &c., were universally approved.

Fast Winding from One Shaft at the Maltby Main Colliery.

The Maltby Main Colliery's output of coal from one shaft for the week ended Dec. 16 last was 21,090 tons. This is the highest output obtained from No. 1 shaft at this colliery since the pits were sunk.

On Oct. 26 last, in one shift, 2694 tons 18 cwt. were drawn through the No. 1 shaft in 7½ hours' winding. This large output is drawn from a depth of no less than 820 yards—practically half a mile. The time occupied in winding from this depth, including loading at the pit bottom and discharging at the surface, is 76 seconds.

The Maltby Main Colliery is a constituent company of The Yorkshire Amalgamated Collieries, Ltd., the other collieries constituting this group being Denaby and Cadeby, Dinnington, and Rossington Main.

The annual potential output of the group exceeds 5 million tons.

THE NEWS—*continued.*

History of Leicester's Gas Undertaking.

Mr. H. Pooley, M.Inst.C.E., Engineer and Manager of the Leicester Corporation Gas Undertaking, gave some interesting facts and figures in relation to the Leicester Gas Undertaking in an address at the Vaughan College on Dec. 15, under the auspices of University College, Leicester. He showed a number of explanatory lantern slides, and also exhibited some samples of bye-products.

The original gas-works in Leicester, he said, were built in Belgrave Gate, near the canal, and the town was first lighted by gas on Oct. 30, 1821. These works supplied all the requirements of the town up to 1879.

In 1875 the Leicester Gas Company purchased land at Aylestone, and about three years later the foundation stone of the Aylestone Road Gas-Works was laid. It was in that year—1878—that the Corporation purchased the Gas Undertaking for the town for the sum of £480,000. At the present time the total capital expended amounts to more than £2,000,000.

Leicester gas is regular in point of quality throughout the day, said Mr. Pooley. Tests for quality are made at the works and at the central offices. More than 150 readings are recorded in a day and these are taken seven days a week. The largest new gasholder contains, when filled, 5 million c.ft. of gas, representing a value of nearly £850, and is a giant compared with the first two 13,000 c.ft. holders at the original works.

From 36 in. in diameter, the Leicester mains vary to 3 in., although very few of the 3-in. type are in use now. Gas is supplied to 23 villages in the vicinity of the city, and there are altogether 72,000 consumers in Leicester. In the last few months thousands of new gas lighting points have been fixed, and from prepayment consumers in 1931 nearly 600 tons of coppers were collected.

The sale of gas during the first 12 months' working of the Leicester Gas Company was just short of 2 million c.ft. During the financial year ended March 31, 1932, the sale amounted to 2635 million c.ft. The Gas Department shares with the Water Department the honour of being the city's oldest municipal trading undertaking, and it has contributed in the past more than £900,000 to the city in aid of the rates.

An area of supply of more than 93 square miles is served by the Department, and there are 82,000 gas meters connected to the mains, and it is true to say that with very few exceptions gas is used in practically every dwelling within reach of the Department's mains.

At March last, 102,000 gas appliances were acquired by the consumers through the Department.

This lecture by Mr. Pooley was one of a series which is being given by the Chief Officers of the Corporation respecting the public services of the City of Leicester.

Parliamentary Intelligence.

[From Our Special Correspondents.]

House of Lords.

Special Orders.

The Special Orders Committee has met to consider the following Special Orders: Buxton; Hampton Court; Coatbridge; Liverpool; Watford and St. Albans; Weymouth; and Grantham.

House of Commons.

Special Orders.

The following Special Orders have been approved by the House: Buxton Corporation; Coatbridge Gas Company; Hampton Court Gas Company. Plans have been deposited in connection with the Swindon Gas Order and the Weston-super-Mare Gas Order.

Private Bills.

It has been announced that the following Private Bills will be first introduced in the House of Lords: East Hull Gas; South Metropolitan Gas; and South Suburban Gas. This leaves the Commercial Gas Bill and the Gas Light and Coke Company Bill to start in the House of Commons.

Gas Acts (1920 and 1929) Orders.

APPLICATION FOR SPECIAL ORDER.

Weston-super-Mare Gas Company.

To empower the Company to purchase the undertaking of the Cheddar Gas Company, Ltd.; to extend the limits of supply; to make various financial provisions; to authorize the use of scheduled land for gas purposes, &c.

Consumers' Gas Company of Toronto.

The Eighty-Fourth Annual General Meeting of the Consumers' Gas Company of Toronto was held at the Company's Auditorium, 55, Adelaide Street East, on Monday, Nov. 14, 1932. In the absence of the President, Mr. A. W. Austin, the VICE-PRESIDENT, Mr. Arthur Hewitt, was called to the chair.

The SECRETARY presented the annual report of the Directors and the financial statements and reviewed the items in the income account and balance-sheet. Referring to the decrease of $66,350.38 in the revenue from gas sales for the year, as compared with the preceding year, he stated that the reduction in the price of gas made effective on April 21, 1931, had been responsible for a shrinkage in revenue of $160,000.00, but that an increase in the volume of sales had compensated for the loss of revenue to the extent of $94,000.00. He stated that the domestic gas sales which constituted a high percentage of the total business had shown an increase for the year.

The Secretary, in referring to the amount drawn from the special surplus account—viz., $205,607—explained that the necessity for this withdrawal had come about partly by reason of increases which had taken place in certain items of uncontrollable expenditures. The total amount of additional operating expense which had been taken into the accounts for the year, consequent upon the increases in the items mentioned, was $305,000. He pointed out that as the special surplus account had been drawn upon to the extent of only $205,607, it was evident that not only had the whole of the reduction in the price of gas been taken care of, which for the year had amounted to $300,025.10, but that in addition there had been absorbed some $100,000.00 of the increases in the special items of expenditure enumerated.

In moving the adoption of the report, the VICE-PRESIDENT, Mr. Arthur Hewitt, said that the results shown in the financial statement were very gratifying, as they were under such unusual conditions. The Company, he stated, was now reaping the advantages of extensions made to the distribution system during the past seven years.

BOOK REVIEWS

"The Catalytic Oxidation of Organic Compounds in the Vapour Phase"*

Reviewed by E. W. Muddiman, B.Sc., F.I.C.

During the last decade we have seen the publication in this country of a fairly large number of monographs on Industrial Chemistry, but we have nothing so comprehensive in range as the two series, scientific and technological, which have been issued of late years under the auspices of the American Chemical Society. The 61st Monograph of the Technological Series has just been published by the Chemical Catalog Company, Inc., of New York, and if the standard of the preceding volumes is in keeping with this one, the American scientific men are indeed fortunate.

The Monograph under review is devoted to the catalytic oxidation of organic compounds in the vapour phase, and is written by L. F. Marek and Dr. Dorothy A. Hahn. The general idea throughout the book is that of tracing the development of individual catalytic reactions from their inception, through the laboratory stages to their technical achievement where this has been possible, and a chapter is devoted to each group of reactions. After an interesting résumé of modern theories regarding the phenomenon of catalysis, the first chapter deals with the catalytic decomposition (excluding oxidation) of alcohols. The chief products obtainable from ethyl alcohol are acetaldehyde, ethylene, and ethyl ether, and by suitable variations of temperature, pressure, and catalyst, one or other of these decomposition products can be made to preponderate. Thus with copper catalysts, yields of over 90% of acetaldehyde are obtainable from ethyl alcohol, while if silica gel be used the gases evolved during ethanol decomposition contain more than 80% of ethylene and 15% of hydrogen. Acetone, which was formerly made almost exclusively by the dry distillation of calcium acetate obtained in the destructive distillation of wood, is now made on a large scale by the dehydrogenation of isopropyl alcohol produced largely from the hydration of propylene contained in oil refinery gases.

By catalytic oxidation alcohols can be converted, *inter alia*, to aldehydes and acids, and the chapter on this reaction is very complete, many patents being cited and a careful summary of most of the published research work being given. It is interesting to note that high yields of aldehydes can be obtained at temperatures below 300° C. from alcohols by suitable catalysts (silver or gold precipitated on asbestos), even a 12-carbon alcohol giving an 80% yield of the corresponding aldehyde, and geraniol giving citral without decomposition. Attention has recently been given to the reaction of carbon monoxide with alcohols to form fatty acids, but the side reactions are so numerous and involved that a suitable catalyst for industrial operation has not yet been found, and pressures of the order of 200 atmospheres are necessary. Acetaldehyde can be converted in over 90% yield to practically pure acetic acid by using a ½% of manganese acetate as catalyst and an air pressure of 100 lbs. per sq. in.

Of greater interest to the Gas Industry is the long chapter on the chemistry of the synthesis of hydrocarbons and alcohols from water gas. The present-day commercial methods used are not described, a more general theoretical account of the reactions and of the catalysts used being given instead. The term " water-gas equilibrium " applies primarily to the gaseous system: carbon monoxide, carbon dioxide, hydrogen, and water vapour, but at different temperatures and pressures the interaction of these components may result in the formation of such substances as methyl alcohol, methane, ethylene, formaldehyde, ethyl alcohol, or acetic acid. High yields of methane can be obtained by a suitably prepared nickel catalyst from a carbon-monoxide hydrogen mixture, while hydrocarbons higher than methane up to solid wax have been prepared with iron or cobalt catalysts. As regards oxygenated compounds, it is possible to direct the reaction almost quantitatively towards methyl alcohol (methanol) formation by the use of fairly high pressure, since the production of methanol is accompanied by a larger decrease in volume than is the case in the formation of hydrocarbons from water-gas. (In 1925 over half-a-million gallons of synthetic methyl alcohol were imported from Germany into the United States.) The mechanism of the reaction and the efficiency of the various catalysts are well described in this chapter.

The oxidation of methyl alcohol to formaldehyde is an important commercial proposition, because of the widespread use of formaldehyde in bakelite manufacture, in the hardening of gelatine, tanning of leather, and disinfection. The process is apparently simple, but requires close temperature control and regulation of extent of reaction to prevent undue loss of raw material; usually 82% yield is the maximum obtained. Much research work, recounted here historically in detail, has had to be carried out before the conversion could be operated on an industrial scale.

A long account is given of the catalytic oxidation of gaseous paraffin hydrocarbons, since the utilization of the enormous quantities of these hydrocarbons has been the object of long and patient investigations. The volume of methane, ethane, propane, and butane available in the United States alone during 1927 has been estimated at 2,472,000 million c.ft., and although the present major use of these gases is as fuel, they are potential sources of methyl and higher alcohols, formaldehyde, acetaldehyde, and formic and higher fatty acids. The partial oxidation of natural gas has been carried out in America by one firm during the removal of very small proportions of oxygen from the gas prior to transmission through long pipe-lines, the object being the prevention of corrosion. The oxidation is conducted at a pressure of about 400 lbs. per sq. in. on the outlet side of the compressor stations, and a daily production of 70,000 gallons of a mixture of methanol, formaldehyde, and acetaldehyde has been reported. No details are given of the means of utilizing this liquid mixture commercially.

Gas from the cracking of petroleum oils is usually rich in olefine hydrocarbons, and is available in vast quantities for oxidation or conversion to other products. No oxidation process has been evolved for its successful industrial exploitation so far, although a number of patents have been issued. The hydration of olefines is being carried out on a large scale by hydrolyzing the sulphuric acid esters formed by absorption of the olefines in sulphuric acid. Hydration of ethylene in the vapour phase to ethyl alcohol is possible by steam under high pressure, but the proper choice of catalysts for the reaction is a very important factor, since polymerization of ethylene to higher hydrocarbons is easily induced. Also, the difficulties of separating the alcohol from the dilute liquid condensate and of purifying it from hydrocarbon polymers make it probable that direct hydration processes will be unable to compete as long as cheap sulphuric acid is available.

Since the advent of synthetic ammonia, synthetic methanol, and coal hydrogenation, there has been a large and increasing demand for cheap hydrogen, which is now generally produced by the water gas catalytic process from solid fuels. In the States there are enormous quantities of methane and ethane obtainable at a very low price, and the successful production of hydrogen and carbon monoxide from this hydrocarbon mixture would be of great industrial importance. In a chapter devoted to this conversion, the various methods of catalytic oxidation which have been, and are being, tried out are described, and the difficulties encountered in such partial combustion processes are indicated. It is also possible to react the lower paraffin hydrocarbons with steam to form hydrogen, and there is a good account of the various ways in which this has been done.

It is somewhat surprising to find in the book a chapter on surface combustion, followed by a longer one on knocking in internal combustion engines. Both are well written, the latter one particularly, and much of the research on vapour phase oxidation is shown to be of service in attempts to solve the difficult problems associated with the causes of engine knocking and mechanism of anti-knock action of inhibitors.

The remainder of the book deals with the oxidation of benzene, naphthalene, anthracene, and miscellaneous polynuclear hydrocarbons. It has not yet been found possible to oxidize benzene into phenol directly, on a commercial scale, partly because of the low price of phenol produced

* "Catalytic Oxidation of Organic Compounds in the Vapour Phase," by L. F. Marek and D. A. Hahn, The Chemical Catalog Company, Inc., New York; price, $9.00.

from coal tar distillates, by chlorbenzene hydrolysis, and by the benzene sulphonation method. Toluene can be oxidized in the vapour phase to benzaldehyde and benzoic acid, and large yields obtained, but there are many difficulties—such as cooling, collection, and separation of the reaction mixture, and explosion risks—to be overcome before large-scale production is realized. In the case of naphthalene, the most important of its oxidation products is phthalic anhydride, and there is a lengthy account of the researches by which it was produced in quantity in the States at the close of the war. This catalytic air oxidation process was undoubtedly an excellent performance on the part of several American chemists, and the quality of the phthalic anhydride sent to this country for dyestuffs manufacture was extremely good.

The book closes with a chapter on the apparatus and plant which are being applied in the manufacture of oxidation products from aromatic and aliphatic hydrocarbons. Its treatment is necessarily rather superficial because of the scarcity of published information on the processes, but it gives an idea of the troubles met with in the development of a new branch of chemical technique.

This volume can honestly be recommended to all who are interested in the most recent trend of scientific effort for utilization of hydrocarbons, and it deserves a wide circulation in this country as well as in America.

EXHIBITION HOUSES

Demonstrating the Uses of Gas to Private Consumers

An Interview with Mr. J. Sandon Stubbs, F.C.I.S., Secretary and Treasurer, Liverpool Gas Company

During the past six months, the Liverpool Gas Company have participated in no fewer than three Exhibition Houses, and January will find this propaganda being continued by another exhibition. It is the Company's experience that, of all the various publicity methods open to a large gas undertaking, none is quite so effective as an actual demonstration of how gas can make the home more comfortable, more convenient, and more hygienic. The best advertisement is a house wherein gas supplies light, heat, and power. That is why the Liverpool Gas Company are participating in another exhibition house, *the fourth within seven months.*

" Although it is impossible to ' key ' results accurately," said Mr. J. Sandon Stubbs, Secretary and Treasurer of the Liverpool Gas Company, " we are firmly convinced that such exhibition houses create a great deal of new and valuable business. At the present time, when industrial concerns are consuming less than usual, it is extremely important that strenuous efforts should be made to increase the number of gas appliances used by private consumers. To bring about this increase, it would be difficult to find a method more effective than exhibition houses, in which gas is shown to be the housewife's ever-ready and always-economical servant.

" No matter how attractive and efficient the showroom may be, it cannot substitute for an actual house in the suburbs, furnished and decorated, all ready for occupation, garden set out, with gas appliances of various types in every room, all capable of demonstration to the public.

[*By courtesy of the " Liverpool Evening Express."*

The Lord Mayor of Liverpool (Alderman J. C. Cross, J.P.) speaking at the opening of the All-Gas House in Liverpool. The Lady Mayoress is seen next to the Lord Mayor.

[*By courtesy of the " Liverpool Evening Express."*

Miss Jean Colin, the popular Musical Comedy and Film Star, opening the " Liverpool Evening Express " Exhibition House.

" The one difficulty about an exhibition house is this—how are people going to be told about it, and what will induce the public to make a tram or 'bus journey to visit it? Here co-operation with the local Press is invaluable. For instance, our last exhibition house, in a suburb four miles out of Liverpool and ten minutes' walk from the nearest tram route, was visited by almost 8000 people. Now, if an individual spends time and money in travelling to an outlying suburb, he or she must be genuinely interested; and consequently we may assume that a very high percentage of such people are potential users of gas for domestic purposes.

" During the exhibition, a simple jig-saw puzzle is organized, with prizes of £40, conditions being (1) that the prize money must be used to purchase goods from one of the concerns participating in the exhibition house scheme, and (2) that each entrant state to which concern he wishes the cheque—should he be successful—made payable. In our

last exhibition house, the first prize winner stipulated for a cheque made out to us, so that in addition to all the other new business, we sold an extra £20 worth of gas appliances. The prize, of course, is provided by the organizers, the 'Liverpool Evening Express.'

"It was extremely satisfactory to find a large number of competitors asking for cheques in favour of the Liverpool Gas Company. The 'Evening Express' kindly supplied us with a list of all unsuccessful competitors who made this request. As every single one of these individuals must be actually in want of one or other of the gas appliances which we supply—else, why a cheque made payable to us?—we decided to exploit this source of business immediately. A letter was sent to all these unsuccessful competitors, enclosing a 2s. copy of "The Radiation Cookery Book" and offering, as a consolation prize, if they so wished to regard it, a discount of 10% off all gas appliances purchased within the next thirty days. As a direct result, we sold several all-enamel gas cookers next day! The offer does not expire for another week yet, and therefore I cannot state what percentage of people have actually taken advantage of the 10% discount. I can say, however, that the scheme has proved extremely successful.

"I mentioned the need for publicity in the local Press. Liverpool is fortunate in this respect, for the 'Evening Express' has always been ready to support gas. The Advertisement Manager carries out all the arrangements in connection with these exhibition houses, negotiating with builders, decorators, furnishers, and other firms, giving widespread publicity to the opening ceremony—invariably performed by a celebrity, local or otherwise—and publishes articles descriptive of the gas appliances in each room, the decorative schemes, and the furnishings. Such editorial matter is supported by advertisements inserted by the firms concerned. 'Evening Express' bills are posted along main and side roads, route-marking the way for visitors who come by tram, 'bus, and motor-car. All the rooms are set out, as if in occupation, with books in the bookcases, cooking utensils filled and ready for use, hot water at every hot water tap, gas fires all alight, and cigarettes in the smoker's cabinet. In wet or frosty weather it would be difficult to imagine a more inviting interior. The houses are always in a good-class neighbourhood, soundly-built and attractively furnished.

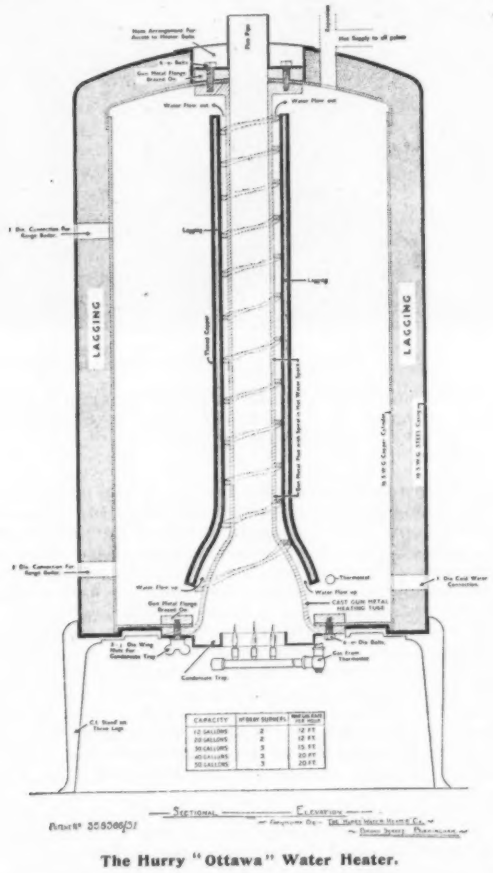
"We have one of our salesmen in attendance, and during the last exhibition house he booked orders personally for gas appliances to be fitted to 94 different houses. This, of course, is only a fraction of the business which ultimately materializes, directly or otherwise. As I said before, it is difficult to trace results in every case, but during and after each exhibition the showrooms appear to be busier, and orders and inquiries more numerous. A certain increase would take place automatically in the autumn, of course, but our impression is that part of this increase is due to exhibition house propaganda.

"In Liverpool our relations with architects and builders have been very happy. Such practical people are quick to realize the advantages of Liverpool gas, which is cheap, and can be recommended with confidence to the thousands of people now taking possession of their first house."

NOTES ON PLANT AND PROCESSES

A New Water Heater.

Our illustration shows a section of the interior of a new water heater manufactured by the Hurry Water Heater



The Hurry "Ottawa" Water Heater.

Company, of 39, Broad Street, Birmingham. This new appliance, which is termed the "Ottawa," is a self-contained heating unit and storage cylinder, and is offered in five sizes, from 12 gallons to 50 gallons capacity. Steaming hot water can be available at sink, lavatory basins, and bath—or at any hot water tap—at all hours of the day and night.

When the whole of the water in the cylinder reaches a temperature of 140° F., the gas consumption is automatically reduced from a maximum of 12 c.ft. to 1¾ c.ft. per hour. The apparatus is so efficiently lagged with non-conducting material that 1¾ c.ft. of gas per hour is sufficient to maintain the whole of the water in the cylinder at a temperature of 140° F.

The "Ottawa" has been specially designed and constructed for hard and soft water districts, the container being made of strong sheet copper, tinned inside, while the parts which come into contact with the flue gases are of cast gunmetal; thus all possibility of maintenance troubles is eliminated.

A Fortieth Anniversary Pamphlet.

The year 1932 marks the fortieth anniversary of Messrs. Humphreys & Glasgow, Ltd. Since 1892 this firm—whose history is a romance of engineering skill and sound business policy—have served the Gas Industry extremely well, and the information contained in a commemorative brochure they have published is full of interest. It is quite obvious that the facilities which "H. & G." are able to offer are now greater than ever.

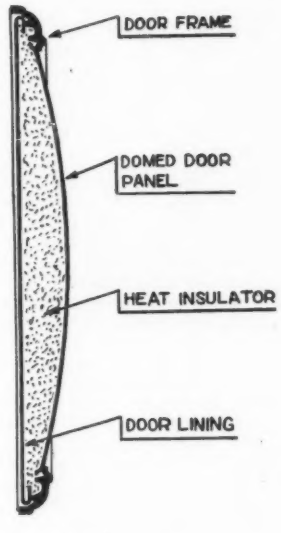
The advantages of carburetted water gas are set out clearly and without exaggeration. The collateral advantages are many. Small ground space occupied in relation to output of gas; little wear and tear; availability (cold plant can be brought into operation within an hour or two) and flexibility; saving in storage capacity; control of the coke market; independence of labour—these are some of the features which account for the popularity of carburetted water gas. Again, C.W.G. plant enables coal gas plant to be worked at optimum capacity, and this at the lowest economic level, on any type of coal it is desired to carbonize.

Including the work of their American colleagues, the United Gas Improvement Company, 2047 carburetted or blue water gas sets have been (and are being) constructed, with a total capacity exceeding 2254 million c.ft. per day.

New "Dome" Panel Cooker Door

Top view showing new concealed hotplate taps.

Cooker showing new domed panel door.



Section through domed panel door.

The Parkinson Stove Company, Ltd., of Stechford, Birmingham, have inaugurated a new fashion in gas cooker door design by the introduction of a "dome" panel in their latest model "Calthorpe" cooker. This innovation considerably improves the appearance of the cooker, though this can only be fully appreciated by inspection of the new model. It also adds appreciably to the thickness of the door packing, which, of course, improves the heat insulation at this point.

A further improvement has been effected on the latest model "Calthorpe" by fitting concealed gas taps of a new pattern to the hotplate burners. The taps are placed under the cornice, where they are unlikely to be turned on accidentally, and the bakelite handles show the indicator "Off" clearly when in that position. These cookers are fitted with the latest improved type of patent "Ajusto" oven control, of enclosed design, showing one visible number only at a time, which facilitates easy reading. A special get-at-able filter incorporated in the controller ensures that dirt and dust from the service cannot enter the valve and impair its action. Moreover the filter can be removed for cleaning at any time without disturbing the "Ajusto" gas connections in any way.

CONTINENTAL NOTES

DELAYED FORMATION OF IMPURITIES IN TOWN GAS AND ITS CONSEQUENCES IN THE DISTRIBUTION SYSTEM.

Dr. Nauss in "Das Gas- und Wasserfach," 1932, 75, 985-988 (Dec. 10), points out that gas freed from all traces of sulphuretted hydrogen is by no means pure, and refers to the corrosion which proceeds in distribution systems due to the presence of oxygen, carbon dioxide, hydrocyanic acid, and sulphur compounds.

In presence of ammonia, the carbon disulphide contained in purified gas undergoes numerous reactions in which sulphuretted hydrogen is formed, and though a gas absolutely free from sulphuretted hydrogen may enter the mains, sulphuretted hydrogen is ultimately produced and gives rise to corrosion. It is thus essential to effect complete removal of ammonia from the gas.

Some types of oxide, especially those containing alkali, may give rise to formation of sulphuretted hydrogen from carbon disulphide, though, after a period of use, when the oxide has become more highly dispersed, this sulphuretted hydrogen is taken up in the normal manner. Moreover, in course of time, the alkalinity of the oxide disappears, since, in the revivification process some ferrous sulphate, which neutralizes the alkali, is formed. Care should thus be taken in the case of Lux mass, just as with bog iron ore, not to charge new oxide into the final purifier.

Sulphuretted hydrogen may also be present in town gas which has been scrubbed for benzole recovery as a result of reaction between carbon disulphide and organic bases in the washers if these are situated after the purifiers. This is, however, likely to occur to a much less extent when gas oil is used as a scrubbing medium than when creosote oil is employed.

Reference is made to the need for a satisfactory process for removing organic sulphur from gas and to the desirability of distributing dehydrated gas.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Scientific Investigation and the Utilization of Town Gas*

Presidential Address of Mr. J. W. Wood to the Yorkshire Juniors

[Extract.]

My subject is the relation of scientific investigation to the successful utilization of town gas, with special reference to domestic gas, which still forms the major portion of the load in most areas.

It is vital to our Industry that we should have safe and efficient gas appliances, simple to operate, of good appearance, durable, and relatively cheap. It is to some, or all, of these ends that scientific investigation has been directed in recent years.

Bearing in mind that I am addressing a Junior Gas Association, I feel that I cannot do better than call your attention to the wealth of information contained in the Research Reports of the Institution of Gas Engineers, carefully worded and based upon experimental evidence obtained in such circumstances as to be independent, authoritative, and of permanent value. It is my intention to review some of the principal phases of that work in so far as it has reference to gas utilization.

Gas Quality.

The scientific worker has the best chance of success when he is faced with a definite and clearly stated problem. Such was the case when I took up my duties as Research Chemist in 1917.

The stripping of gas and the unavoidable deterioration of carbonizing plant during the war period had resulted in town gas supplies lower in calorific value and higher in "inerts" than would ever have been dreamed of in pre-war days. The problem was, therefore, to ascertain whether, and to what extent, the performance of gas appliances was affected by these changes.

For this purpose we selected certain representative gas appliances of the period and devised suitable tests for determining their performance. They included a number of gas rings, for which a simple water-boiling test was developed; a number of gas fires of which the radiant efficiency was determined by the "Leeds" method; and a number of upright and inverted incandescent mantle burners for which the illuminating power was determined in the usual way.

It will be observed that these appliances are arranged in order of the temperature gradient between the flame and the substance being heated, and they may for convenience be referred to as low, medium, and high temperature uses of gas respectively. Each of the appliances was tested at a series of gas rates with mixtures containing progressively increasing amounts of "inerts"—*i.e.*, nitrogen, carbon dioxide, and air—up to more than 50% by volume.

In the low and medium temperature applications of gas it was found that the gas quality was comparatively unimportant so long as heat units were supplied to the burner at the same rate by appropriate adjustment of the gas rate. In the case of gas lighting there were observable differences as the addition of inerts was increased, carbon dioxide being more deleterious than an equal volume of nitrogen; but unless the total inerts exceeded 10 to 15% the adverse effect was not a matter of practical importance. When blue water gas low in inerts was tried, an enhanced lighting effect which might have been expected upon theoretical grounds was not obtained. This was probably due to the unsuitability of the flame size and shape for the standard mantles used, and shows how one can be misled by basing conclusions upon a single factor—in the case of blue water gas, upon its higher "theoretical flame temperature."

One point should be made quite plain: In carrying out the above investigations no structural alterations to the appliances were permitted, beyond the provision of an air-shutter and enlargement of the gas nipple where excessive aeration or inadequate supply of heat units were the causes of unsatisfactory operating conditions. It is, highly probable that greater efficiencies might have been obtainable with some of the grades of gas if they had been burned in appliances specially designed for their utilization. This is a field in which comparatively little work has been done, and it may well repay engineers to "tune-up" standard gas appliances and make trifling structural alterations in order to utilize local gas supplies to the very best advantage.

Bearing in mind differences in carbonizing plant, coals, and local conditions, it would be economically unsound to specify, as was at one time expected, a uniform standard of gas quality for the whole country, as being the "best" quality for general use. Instead we are now satisfied if the consumer receives his B.Th.U.'s at a stipulated rate, and this principle of thermal equivalence is the fundamental idea underlying the provisions of the Gas Regulation Act of 1920, in so far as they refer to gas quality.

Gas Calorimetry.

We have examined a number of recording calorimeters designed by various makers and proposed for use under the Gas Regulation Act, and we have scrutinized most carefully the principles upon which the recorders act, and have subjected them to prolonged tests under working conditions. It may be said at once that these instruments, working often upon totally different principles, do great credit to the ingenuity of their designers, and have achieved a considerable measure of success in operation. On the other hand, when you consider that it is necessary that the instrument should run continuously for periods of a week or more at a time, without attention, and that its record should keep within 1% of the true calorific value of the gas, it is not surprising that the instrument assumes a complex form, and that where three or more components contribute to the final results one hears that these sensitive instruments sometimes break down in detail. I would ask you, therefore, not to stress breakdowns, but to consider rather the excellent service which recording calorimeters can afford in the periods when their records are reliable.

It is not my intention to bore you with details concerning the performance of different types of recording calorimeters, but will content myself with pointing out that the Joint Research Committee has examined the Simmance Total Heat Recorder, the Beasley Recorder, the Fairweather Recorder, and the Sigma Recorder, and details of the examinations will be found in the relevant Reports of that Committee. The Simmance and Thomas instruments have also been reported upon by the Fuel Research Board, while Prof. Boys described his own recorder with many novel points to the Institution of Gas Engineers in 1922. A recently published book by Major Hyde and Mr. Mills gives a very complete idea of the position of our knowledge of exact gas calorimetry at the present day.

Aeration.

When the question of gas quality was under investigation it was apparent that aeration played an important part in determining the efficiency of gas utilization, and an investigation of this subject was undertaken. In one sense the investigation was disappointing, for the experimental work did not lead to the formulation of a few simple rules from which the degree of aeration of a burner might be deduced. On the other hand, it did serve to clear away many misconceptions, and to demonstrate that it was useless to make calculations of air injection by simply equating either the momentum or the kinetic energy of the gas jet

* Meeting at Leeds University, Dec. 10, 1932.

to that of the air-gas mixture in the burner body or issuing from the burner head. The stage has, however, been reached at which, if we know the air injection for a series of gas rates with one kind of gas, the air injection under other conditions can be predicted with some confidence. The breakdown of the purely theoretical treatment probably lies in the fact that in the case of air injection the "secondary" losses due to turbulence and friction account for so large a proportion of the energy available that calculations concerning the energy usefully employed become hopelessly uncertain.

The heating up of a burner usually reduces the degree of primary aeration to the extent of 10 to 25%. As you are aware, gas requires a certain amount of air, known as the "theoretical air requirement," for its combustion, although in practice a quantity somewhat in excess of the theoretical amount must be supplied to secure complete combustion. It is surprising how small this excess need be under favourable conditions. In the case of the atmospheric burner the total amount of air is supplied partly as "primary" air and partly as "secondary" air, and designers are continually striving to produce burners in which the degree of primary aeration shall approach as nearly as possible to the theoretical air requirement of the gas, believing that combustion under such conditions must be more complete and more efficient than that obtained in existing types of burners. Of the truth of this assumption I have yet to be convinced, and, moreover, you must bear in mind that the regulation of the primary air supply in practice gives a control over flame shape and volume which is invaluable in the adjustment of certain types of burners to give the best results.

It is a curious fact that the bulk of the burners on the market to-day take in roughly one-half of their total air requirement as "primary" air; and when you encounter a noisy burner, with well-marked inner cones, possibly on the point of back-firing, it is *not* evidence that the burner is "fully aerated." I have actually worked with blue water gas in a burner capable of injecting twice the amount of air necessary for the combustion of the gas, but owing to the rate of flame propagation in the air-gas mixture have had to close the air slide until only 30% of the theoretical air was being injected, in order to overcome the back-firing difficulty. Generally speaking, I do not think that inadequate primary aeration is a major cause of inefficiency in burners to-day.

Another curious fact is that with typical low-pressure burners the degree of primary aeration increases rapidly with pressure up to 3 in. W.G., after which there is relatively slight increase even if the pressure is taken up to 8 in. W.G.

THE PRESIDENT.

JAMES W. WOOD, M.Sc. (TECH.), A.I.C.

Mr. Wood originally intended to enter the teaching profession, and he served for three years with the Manchester Education Committee. Subsequently he obtained a City Scholarship, tenable for three years at the College of Technology, Manchester. Then he took a course in Applied Chemistry (Metallurgy), and finished as Prizeman in 1912 with the Degree of B.Sc. (Tech.). He became Schuster Scholar, and carried out research under Mr. E. L. Rhead upon case-hardening of steel by gaseous carburizing agents, for which he was granted the Degree of M.Sc. (Tech.). He entered industry as Works Chemist to Messrs. Wetcarbonizing, Ltd., of London and Dumfries, the engagement being terminated at the outbreak of the war. Because of previous military training, he offered his services as officer, but was repeatedly rejected upon medical grounds. He then moved to London, and accepted an appointment as Lecturer in Engineering Chemistry at the Battersea Polytechnic late in 1914. The Polytechnic Authorities allowed considerable freedom, and Mr. Wood was able to utilize his special training in chemical and chemical engineering subjects in the national interest, covering such varied subjects as experimental work on naval and military shells, oil extraction for foodstuffs and glycerol, and the synthesis of drugs. In July, 1917, Mr. Wood entered the Fuel Department of the University of Leeds, under Prof. Cobb, as Research Chemist to the Gas Heating, Lighting, and Ventilation Research Committee, the forerunner of the present Joint Research Committee of the Institution of Gas Engineers and the University of Leeds—an appointment which he has held since that date. He has been the Research Chemist directly responsible for conducting the experimental work authorized by the Committee upon the subject of Gas Utilization, and numerous reports have been published dealing with the relation between gas quality and efficiency in use, aeration of burners, recording gas calorimeters, and products of combustion. Throughout this period a close contact has been maintained with the Industry by virtue of the fact that the experimental work has been carried out first in the laboratories of the City of Birmingham Gas Department, and latterly in those of the City of Leeds Gas Department, with whose staffs the Research Chemists have freely exchanged views. Mr. Wood is a familiar speaker at the meetings of the Institution of Gas Engineers, and his work is known both on the Continent and in America. He was formerly a member of the Midland Junior Gas Association, and has held junior offices for a number of years with the Yorkshire Association before occupying its Presidential Chair.

Ring Burners.

Considerable changes have come over the gas rings attached to domestic hotplates within the past fifteen years. The plain drilled burner with vertical or oblique drillings, in which the inner circle of jets was often smothered out, is being rapidly replaced by the high efficiency types. There is also some effort being made to prevent wastage of gas by keeping the maximum consumption below 20 c.ft. per hour, a rate which need hardly ever be exceeded in domestic work if the gas is used efficiently. We were able to show that with the older burners considerable increase in efficiency could be obtained by adjusting the distance between the face of the burner and the bottom of the vessel being heated, this distance frequently being far too great and permitting the ingress of large volumes of chilling air. The newer burners with nearly horizontal flames can be brought much closer to their vessels, and the distribution of the flames gives much better opportunity for the access of adequate secondary air, properly applied, and the free escape of the products of combustion.

The changes in the design of pan-bearers provide an interesting study.

A thermal efficiency of 50% should be readily attainable on a modern hotplate with clean and suitably proportioned utensils.

Gas Ovens.

Mr. Barker and others have designed calorimeters for use inside gas ovens; some workers have used bags of wet sand and judged performance by the loss in weight; scorching tests with sheets of paper, either plain or coated or treated with sulphuric, have been proposed; but the most popular test seems to be a bread-baking contest using standardized dough under stipulated conditions. There is, however, difficulty in reporting the results quantitatively. The gas consumption for the cooking of typical standard meals is also a popular method of assessment, but as much depends upon the cook as upon the cooker in such cases. Mr. Forshaw, working on behalf of the Institution of Gas Engineers, devised oven tests in which four main factors were considered: (1) The consumption of gas required to reach a specified temperature in a given time; (2) the consumption necessary to maintain a specified temperature; (3) an "overload" test to be certain that the oven would not smother at high gas rates; (4) a practical bread-baking test such as has just been mentioned.

As to the changes which have taken place in oven design, the adoption of lagging and improvement in internal and external appearance by the free use of enamel are fairly obvious. The efficiency has been increased in so far as the oven can be maintained at a working temperature with about half the amount of gas formerly required. The relative merits of single and double oven burners and top and bottom flue outlets have been strongly debated. Perhaps the most noteworthy advance, approaching very closely to scientific control, has been the fitting of thermostats to gas ovens, these usually taking the form of a robust differential expansion mechanism working a valve on the gas supply.

There is still lack of uniformity as regards the practice of fitting flue pipes to the outlets of gas ovens. In practically

all cases the products of combustion of the gas are themselves harmless enough, but if the acrid vapours from roasting operations and the water vapour could be conducted out of the kitchen without any risk of smothering taking place in the oven, it would be conducive to the comfort of the housewife.

Gas Fires.

Leeds University has long been associated with the methods devised for the testing of gas fires, especially in regard to radiant efficiency. The earliest work of the Committee carried out by Dr. E. W. Smith, demonstrated the advantages of the columnar type of radiant, fitting instead of obstructing the flame, and raising the radiant efficiency from 25% to 40% on the gross C.V.

Much work has been done on the development of the gas fire, with which the names of Dr. Hartley and Messrs. Radiation Limited are naturally associated in our minds. The paper given by Dr. Hartley at the recent Autumn Research Meeting of the Institution of Gas Engineers gives some idea of the approach which is being made to fundamentals in the design of gas fires.

The time has come when the gas fire is ceasing to be regarded as a mere imitation of the coal fire. Instead, attempts are being made to exploit its own special features to the full. The study of the character of the radiation as well as its quantity, and definite attempts to control the quality of the radiation, are now established features of modern practice.

At the moment there seems to be a revival in the purely convector type of heater, especially if we include in this class the newer panel heating system advocated by Mr. Barker and the compact wall panels of Messrs. R. & A. Main.

A fault with the early gas fires which did untold harm to their rapid adoption was their inadequate flue outlets. Again the Gas Heating, Lighting, and Ventilation Research Committee, with Mr. Harrison as its Chemist, did most valuable work in measuring the actual ventilation produced with different fires and in pointing out the mistakes that were being made. Manufacturers were not slow in rectifying the defects once they were pointed out, and soon the 2½ and 3 in. circular flue outlet ceased to exist, being replaced with the rectangular openings of some 30 sq. in. typical of the modern gas fire. At the same time single and double canopies of adequate dimensions, with smooth lines leading gradually to the flue outlet, and with swivelling flue outlets were marketed.

Work done at Leeds, and particularly that of Mr. Masterman and Mr. Dunning, of the Watson House Staff of the Gas Light and Coke Company, has demonstrated clearly that the gas fire can efficiently warm a room and at the same time provide adequate ventilation for maintaining it in a comfortable and healthy state, none of the products of combustion from the fire coming into the room. Mr. Masterman's work on ventilation deserves special study, for it covers many other gas appliances than the gas fire.

Time does not permit of a more detailed consideration of the gas fire, but one must mention the great simplification and removal of Victorian ornamentation from the castings, the development of the silent injector, and improvements in the insulating properties of the firebrick back.

Water Heaters.

The domestic hot water supply is a field well worth cultivating by the Gas Industry. The ordinary geyser still holds its own, and, with interlocking gas and water taps for safety and a thermal efficiency of 75 to 80%, will continue to do so for some time. When in operation the gas consumption is high (120 to 140 c.ft. per hour for a 2½ gallon heater), and special care is therefore necessary in installing these appliances in small sculleries and bathrooms. The principles underlying the installation of suitable flues, bafflers, and terminals are now well understood, and in this connection I must once more refer you to the excellent work published by Mr. Masterman.

The multi-point geyser is an obvious step from the model I have just described, but this is now meeting strong competition from the storage types of heater made in sizes from about half-a-gallon up to many gallons, and fitted with thermostatic control.

In nearly all water heaters the problem of corrosion must be seriously considered. At present there are three main methods of dealing with this bugbear. The burners may be so arranged that some preheating of the water takes place by conduction from a relatively hot metal screen, so that when the water reaches the main heat-exchanger it is above the dew-point of the products, and condensation therefore does not take place. This will reduce, if not entirely eliminate, corrosion in the appliance itself, but may only transfer the difficulty to the flue-pipe if that is in a cold and exposed situation. The second method is to secure as much condensation in the appliance as possible, providing adequate thickness of metal to withstand corrosion, and ample drains so that they will not choke up. The third method must be regarded as an improvement on the second in so far as condensation in the appliance is permitted but materials specially resistant to corrosion are used for its construction. Much attention is being given at the present time to this aspect of the subject.

Products of Combustion.

Why need we worry our heads about products of combustion? In the main they consist of harmless carbon dioxide and water vapour, and could with impunity be discharged into the air of our rooms. The fact is that these main products of combustion are accompanied by very small quantities of objectionable constituents such as sulphur dioxide, oxides of nitrogen, and carbon monoxide. The last-named in particular is very poisonous, and it is necessary to have precise information as to the circumstances under which it is produced, so that the appropriate preventive and precautionary measures may be taken.

I would here remind you of a remark made early in my address that it was incumbent upon us to see that none but safe and efficient appliances reached the user. The Institution of Gas Engineers realized this when work upon the products of combustion from gas appliances was initiated.

The leading fact about CO is that in the case of flames freely burning in the open, whether they be flat flames, luminous, or non-luminous, the CO-production is extraordinarily minute, being only one part per 10,000 of gas burned, or 0·25 parts per 10,000 in the theoretical products of combustion. This is much less than normally occurs in the air of our large cities, especially in a hold-up among motor traffic.

In most cases, however, it is necessary to apply the flame to a solid for the purpose of heating it. Here the trouble commences, and CO production occurs to a greater or less extent whenever a flame is chilled or the free access of secondary air is interfered with. Flueless heaters in which no flame contact occurs should therefore be entirely free from objection so far as CO is concerned. The ordinary gas fire is not in quite so happy a position owing to the presence of the radiants in and around the flames; attachment to an efficient flue is most certainly desirable, but it has been shown repeatedly that none of the products of combustion from a properly installed gas fire need enter the room in which it is placed. The gas cooker is entirely safe and efficient if well-aerated flames are used together with suitable pan bearers. It is not sufficient that combustion should be satisfactory with the unobstructed burner. The actual deformation of the flames caused by placing a pan over them can be studied with the help of a Pyrex glass dish filled with water and by means of the pyrographic diagrams which were explained in the Appendix to the 25th Report of the Joint Research Committee.

It must be borne in mind that in all cases in which products of combustion are discharged into a room they undergo dilution before reaching breathing level, so that while the concentration of CO in the theoretical air-free products is often quoted as a uniform basis of comparison, the concentrations actually experienced are much smaller owing to this dilution, which is often very considerable. The water heater presents a case requiring special care. Here the CO-production is quite low until a certain consumption is reached, after which it increases rapidly. One naturally wishes to credit a water heater with as large an output as possible, but it is necessary to see that the maximum consumption attainable by the consumer under local conditions of supply falls short by a safe margin of that at which CO-production becomes marked.

Gas utilization is not less important than gas manufacture, and in addition to finding really new uses for gas—which, after all, may be a matter of chance—intensive work is still essential to see that our present appliances are kept up to the mark and that none but safe and efficient ones reach our consumers. Only by exact knowledge of the performance of existing appliances can we say where improvement can be effected, and such development as does take place is likely to be slow and sure rather than spectacular.

Vote of Thanks.

Mr. Ralph Halkett, Jnr. (Sheffield), proposed and Mr. J. W. Holroyd (Rotherham) seconded a vote of thanks to Mr. Wood, who replied; and Mr. A. Wylie (Sheffield) proposed and Mr. E. R. B. French (Leeds) seconded a vote to the Leeds University authorities and Prof. J. W. Cobb for the facilities granted for the holding of the meeting in the University. Mr. H. J. Hodsman briefly acknowledged.

"Paperette Day" at Perth

Meeting of the Scottish Junior Gas Association (Eastern District), Dec. 3

MODERN EQUIPMENT IN THE SCIENTIFIC CONTROL OF CARBONIZATION.

By JOHN DUFFY, Dundee.

[EXTRACT.]

It has been the endeavour of the Dundee Gas Department to bring the carbonizing plant up to a high degree of efficiency through the introduction of up-to-date apparatus for checking and recording results.

RETORT HOUSE CAPACITY.

In Dundee we have three benches of continuous vertical retorts of the Woodall-Duckham type all parallel to each other and each containing twenty retorts. The north and middle benches consist of forty 5-ton retorts, each bench capable of producing approximately 1·6 million c.ft. per day, while the south bench, with its twenty 6-ton retorts, is capable of producing over 2 million c.ft. In addition, there are three units of Humphreys & Glasgow carburetted water gas plant, the capacity of which varies according to the requirements in respect of calorific power. This may be stated between the limits of 3·5 million of 450 calorific value quality and 4 millions of 500 B.Th.U. quality. A bench of 288 horizontal retorts is still kept in repair to meet eventualities, but with a maximum day's output of 8·5 million c.ft. and an average daily consumption per maximum week of 6·8 million c.ft., it would appear that the vertical retorts (allowing one oven of four retorts to be always off for scurfing) and carburetted water gas plant (with one unit always in reserve) will meet all demands for some time ahead.

The coals carbonized in our retorts are chiefly washed doubles with a small proportion of trebles, singles, and coking smalls obtained from the Fife, Lanark, Lothian, and Ayrshire coal fields.

The method adopted for daily check on the throughput of the retorts is to measure the coal as it passes through the auxiliary box. This is effected each hour by the stoker, before re-charging, marking the position of the indicator on the box, and at the end of his shift totalling the aggregate number of inches in order to arrive at the amount of coal which has passed through. In this way we know the amount of coal each retort has taken per shift. This may seem an arduous task, but it has become part of our routine and gives to us a good approximate check on daily deliveries. This is not, however, the most important feature. Through knowing the amount of coal each bench has carbonized, and the amount of gas produced, one may easily compare results from day to day on each bench. In addition to those daily checks there are the weekly and monthly statistics which deal with the amount of coal carbonized, makes of gas, and tar, coke, and ammonia yields.

The heats on the retorts are taken three times a day by a Cambridge disappearing filament pyrometer, so that at no time is a retort allowed to work at a speed which would allow coke to pass through the extraction in a semi-carbonized state. On the north and middle benches the heats average about 1320° C. and 1300° C. respectively, while on the south bench they are somewhat higher, 1340° C. The retorts are never allowed to work more than a period of six weeks without being let down for scurfing, and any repair that may be necessary to the ironwork is then effected. Of late the repairs of the mouthpiece covers have been considerable on account of the old arrangement of plugs used in the poking holes, but the design of a new cover, incorporating balls and seats, has greatly reduced the upkeep costs.

RECORDING COKE EXTRACTION GEAR.

The coke extractor speeds are controlled by a Bailey recording gyrometer recently installed.

Governing on the benches is effected by the Peebles B.V.R. type operating a Cowan valve. The gas production per bench is measured by Arkon volume recorders and integrators. These recorders were installed to give an approximate record of the volume of saturated crude gas made. The benches with their collecting mains are interconnected to one another and pass in one stream to the condensers. Without the use of those recorders no information is afforded, except by very rough calculation, of the amount of gas each bench is producing. The separate measurement of the gas produced is an important factor if proper control is to be maintained. The Arkon recorder was installed on account of its accuracy and the fact that very little room was required to accommodate it. The recorders run for long periods without requiring to be opened up. They are, however, run down every few weeks to the zero mark for adjustment.

CHECKING THE QUALITY OF GAS COMING FROM THE RETORTS.

I will now describe our arrangement for keeping the responsible shiftmen informed as to the calorific value of the gas which is being produced in the respective benches. We have three Peebles jet photometers, each indicating the calorific value of the gas being made. The supply to these instruments is pumped from the foul main by a Jobson Beckwith No. 2 Essex Pump driven by a ½ h.p. D.C. motor running at a speed of 200 r.p.m. This gas is first passed through a small condenser where a stream of water is continually flowing in the form of a mist. The condenser is made up of six divisions, each compartment containing a layer of coke which has passed through ¾-in. mesh. Gas passes in an upward direction through the coke and out at the top. The water flowing in a downward direction carries with it the ammonia, likewise a considerable quantity of the heavy hydrocarbons, and flows through a seal to the tar main. The gas then passes through a small oxide purifier containing a 12-in. depth of oxide and afterwards to the jets. The calibration of the jet photometer is effected by means of a Union calorimeter. This calorimeter has been found to be very accurate, and consists of an explosion pipette, the lower part of which is pear-shaped, enlarged. The narrow upper part is calibrated similarly to the Orsatt pipette, and can be read as to 0·1 c.c. The total contents of the pipette approximate 100 c.c. The upper end carries a three-way valve through which gas and air are admitted to the pipette. The calibration commences at this point. The lower end of the pipette likewise has a valve attached. It is also equipped with platinum electrodes for the purpose of exploding the gas mixture and also for the electrolytic generation of oxy-hydrogen. The pipette is surrounded by a sleeve. The space between the pipette and the sleeve is filled with calorimetric liquid.

The regulating device serves the purpose of measuring the height of the liquid in the capillary, which is read on a millimeter scale. A reading from this scale gives the calorimetric effect of the explosion. This instrument is used frequently against the jets, so that they may always give a correct indication of the calorific value of the gas. The pump sucks the gas at a greater rate than that required to supply the two governors attached to the photometer, but a relief valve was made by converting an ordinary ½-in. steam valve and weighting the spindle to approximately 4 in. W.G., so that all surplus gas returned to the foul main and a steady supply was thus maintained to the photometers. The north and middle bench pumps are driven by a single motor, the shaft passing through the armature connecting them up.

The first arrangement of the apparatus did not include a condenser, and considerable annoyance from tar and ammonia was caused to the brass parts and to the governors, but since its inclusion these faults have been entirely eliminated. In conjunction with this plant we have converted the old Cowan bell governors into a gas sampling holder by fitting necessary guides so that the bell may rise and fall freely by means of the counterweights attached. This holder is also connected to the foul mains and is invaluable when samples of gas are required to be taken over long periods.

HYGIENIC CONDITIONS—VACUUM CLEANING.

In Dundee we endeavour to have our retort bench in a high state of efficiency as far as hygienic conditions are concerned. There is little doubt that most of the dust on the bench originates from the producers when these are being pricked up. This dust flies in all directions and finally deposits on various parts of the bench. To counteract this, hoods 8 ft. by 3 ft. have been placed over each producer and connected by branch pieces to a common main which runs along the centre of the clinkering platform, taking each producer in turn before being coupled up

to a fan. This fan runs at a speed of 1600 r.p.m., the power being transmitted by a belt drive from a 5-h.p. motor. The dust collected in this way passes into a filter tank containing water, where it settles to the bottom before being run off as sludge. By this means we estimate that about 50% of the dust is collected. The remainder of the dust is vacuumed by a Sturtevant No. 5 special portable vacuum cleaner. To avoid transporting this machine to the upper floors of the bench, it was decided to run 2-in. malleable pipes to convenient points throughout the bench, at which flexible connections are plugged. This project is in course of completion, and I have no doubt that the additional step taken to keep the bench clean will do much to improve the surroundings and result in increased efficiency on the part of both men and plant.

Discussion.

Mr. DAVID VASS (Perth) said he was interested in the vacuum cleaning of the retort house, to which Mr. Duffy had referred. He had gone into this matter to a considerable extent in connection with his own works, and perhaps Mr. Duffy's experience would give him further guidance in the matter. It was not, however, the dust arising through clinkering that had arrested his attention, but that evolved during the discharge periods.

Mr. D. GARRIE (Burntisland) stated that he was interested in the measurement of the crude gas as it left the bench. Could Mr. Duffy tell him what was the actual difference in volume between the crude and the clean gas? At Burntisland he had overcome the difficulty of getting the stokers to work with a slight pressure at the top of the retorts by altering the retort house governor during the rodding periods only, so as to permit of a slight pull during this operation. He considered the method of introducing the Peebles distance control device to work on the standard type of retort house governor as both ingenious and useful, but, at the same time, he was of the opinion that the B.V.R. governor might be more suitably employed in controlling the producer gas supply to the setting, where a gas of constant quality and quantity was essential to the maintenance of proper carbonizing conditions. He also considered that the retort mouthpiece was the chief source of dust; that arising from the fire during clinkering appeared to him to be only of minor consequence.

Mr. A. R. WILSON (Perth) stated that in Perth they had overcome the difficulty of working with a slight pressure on the retort by using "poking" rods of a diameter very little less than the diameter of the whole in the ball valve. These "pokers" were greased before rodding, and the melting grease formed a seal to the gas during poking.

Mr. COWIE (Hawick) asked Mr. Duffy how the coal blending was carried out. Had he experienced any trouble with the blended coal settling out into layers due to coning? The moisture content of the coke seemed to be very low. Did this coke receive any water quenching?

Mr. DICKSON (Cowdenbeath) expressed his interest in the crude gas recorder to which the author had referred. He wondered how the internal mechanism of this recorder stood up to the action of hot crude gas. Was there no tendency for the metal parts to corrode or become jammed up with tar deposits?

Mr. D. WARDEN (President), in concluding the discussion, remarked on the value that contributions of the kind were to the members.

Mr. DUFFY, in reply, said they had experienced considerable difficulty in dealing satisfactorily with the dust from the coke discharges. At present they allowed the dust to settle, and vacuumed it up afterwards. As far as he could determine there was a drop in volume of approximately 33% in the gas volume between the foul main and the station meter. At the charging and rodding periods they allowed the stokers to work with a slight pull on the retorts. They had experienced trouble through tarry deposits in the control plant, but this was now eliminated by the introduction of a condenser. They had no special arrangement for coal blending. The coal, tipped from the wagons by hydraulic rams, was conveyed to the receiving hoppers by single line conveyors. The coke referred to in the paper received no water quenching.

TESTING OF GAS FITTINGS AND METERS.

By C. D. BLACKHALL, Edinburgh.

It is essential that a salesman should have confidence in the goods he is offering to the public. It is still more essential that the public should have complete faith in what they are buying. The Gas Industry has always offered first-class services, embodying high efficiency in gas appliances, and has thus won the confidence of the public. It is on these principles that the prosperity of the Gas Industry has been founded.

To continue to hold the confidence of the public, it is necessary that all appliances and fittings should pass a standard test, in excess of what they are usually guaranteed to do.

In Edinburgh all cocks, cock rails, pendants, &c., are thoroughly tested before they leave the workshops. The test in use is as follows: All stopcocks from ¾ in. to 4 in. are tested at 5 lbs. air pressure, and the cocks are submerged in water. This testing by air under water is a searching and thorough test. A pump to which a gauge is fitted is used, and the results more than justify the time spent. The cock is fitted to the pump and is tested "open" and then "shut." If any bubbles show in the water, the cock is returned to the makers. Leaks have been found in all parts of the cocks, through the pin, through the crosshead of the key, through the barrel, at top and bottom of the cock, &c. The cocks may pass this test, but they are next examined for slack nuts and slack washers.

Observations are taken as to the correct position of pins (these ought not to be too high, as they are likely to shear), and also to ensure that the pins give a proper seal, for cocks have been found with pins which did not allow them to "shut off." The walls of the cocks are next examined to prove that they have been drilled and tapped true, because any weakness in this part may cause a leak when screwed to a pipe.

Pendants are tested at 3 lbs. air pressure for 2 minutes "open" and then for the same time "shut," a plug being inserted at the bottom. If the gauge is steady, they are passed. If the gauge shows a drop from 3 lbs. the pendants are tested under water, in a suitable tank, and leaks are easily discerned. Leaks have been found in the tubes, in the balls and sockets, and also in the cocks. As many as 6% have been found faulty in one batch. This test does away with any possibility of small leaks arising later in the houses where these are fitted, as small leaks are so difficult to detect and are most annoying to consumers. Suppliers are thus kept up to the 100% mark and fitters have every confidence in their work and appliances.

All brass fittings, returned from the district, are examined and repaired by the brass finishers, and after undergoing the usual test are sent to the stores for re-issue. The cost of this work is taken monthly and shows a favourable result as compared with the purchase of new fittings, &c.

Cock rails are also tested under water, and leaks have been detected in metal and in stopcocks also.

When meters are brought in from the district, generally as being too small for present requirements, they are termed "bring homes," and are passed on to the meter provers, who examine and test them. The first test is for "soundness." The meter is connected, gas supply joints being puttied, and is examined for leaks by (*a*) "smelling" and then (*b*) "flaming," care being taken in this operation. The next test is to see if lights are steady or otherwise. This is done by reducing the quantity of gas passed through the meter to 1 in. pressure—*e.g.*, 2 light 6 c.ft., 3 light 9 c.ft., 5 light 15 c.ft., and so on. After this the meter is tested to find out if it is registering small quantities. The quadrant is closed and the cockspur is left open. The cockspur usually passes 3 c.ft. per hour, but this depends on the size of burner used. The meter is then subjected to a full capacity run at 2 in. pressure, and observations are kept while a small pointer completes one revolution on the measurement dial. If the meter is satisfactory after undergoing these tests it is then taken to the heavy pressure holder—*i.e.*, 5 in. pressure—and put through another test for "soundness." After this test the meter is handed over to the painters, and after their attention is ready for re-issue.

If the meters are found faulty in any of these tests—*i.e.*, if under guarantee (new meter or repair)—they are returned to the makers or the repairers for their attention.

The meter testing plant in Edinburgh consists of four measurement holders, one 10 c.ft. and three 5 c.ft., *plus* two heavy pressure holders of 5 c.ft. capacity. Weights are put on or taken off to regulate the pressure to any desired extent. Meters up to 500-light can be tested on our holders.

Prepayment meters to take pennies and shillings are tested with the money to see if the quantity of gas passed is correct. This is done by passing compressed air (governed down from 40 lbs. per sq. in. to 35-tenths gas pressure) through a wet test meter first, then on to the prepayment meter, readings being taken between the opening and closing of the prepayment valve. The test meter is always set at zero for accuracy, and prepayment meter valves are always closed before insertion of the coins. If the registration is incorrect the meters are returned to the makers for re-adjustment.

Burners for street and stair lights are also adjusted in this section to the quantity required per hour. Two hundred burners and by-passes are usually received for adjustment in each consignment, and about 1600 are regulated annually. The burner for street lighting is set for 2½ c.ft. per hour, and stair lights are set for 1 c.ft. per hour, while by-passes are set for 0·25 c.ft. per hour. These are all ad-

justed at 35-tenths pressure with one-minute observation through a wet test meter, pressure being regulated from a holder.

Discussion.

Mr. D. C. HENDERSON (Dundee) asked if the materials and fittings under test were manufactured to a specification issued by the Edinburgh Corporation Gas Department, or were they from manufacturers' stock material? If the latter, did not Mr. Blackhall consider the test of 3 lbs. per sq. in. on pendants and other brasswork to be rather severe, considering the market value of goods of this quality. Were the pendants fitted with half ball and spring or full ball joints? What was the cost per gross of testing fittings in the manner described? Did the Edinburgh Corporation remove meters periodically for re-verification, or were the meters allowed to run until a fault developed? Mr. Henderson said that last year he had had the pleasure of visiting Watson House, and noticed that there also the fittings were tested by air pressure for soundness. They were also examined for pitch of thread, weight and quality of metal, sealing of washers, &c. This work was done by boys in their first year of apprenticeship.

Mr. J. CAMERON (Dundee) asked if Mr. Blackhall had any experience of hot stamped brass stop-cocks, and, if so, whether he had found any improvement on the older type.

Mr. T. M. DUNCAN (Perth) asked if they were still issuing 2-light meters in Edinburgh. If so, to what use did they put them? He noted they still preferred the niting pin to the niting washer on stop-cocks, although on the makers' specification for pendants, &c., the washer had been universally adopted.

Mr. DAVID VASS (Perth) said that many years ago they had used hydraulic power as a means of testing for soundness in M.I. and C.I. fittings, &c. How did this method compare with air testing? There might be a possibility that this method would be suitable on a small works where a supply of compressed air was not available.

Mr. BLACKHALL replied that for pendants they had no specification, and had received no complaint from the makers against the 3 lbs. air pressure test being too severe. For stop-cocks, &c., they worked to their own specification. They had always found that the testing of all fittings before purchase or before returning to stock fully recompensed the initial expenditure, as the occurrence of small untraceable leakages was greatly avoided, resulting in a more satisfied consumer. The half-barrel joint on pendants was adopted. They have not used up to the present any hot stamped brass stop-cocks. It had been their experience when purchasing stop-cocks to the makers' specification to find that, although these cocks were guaranteed to have been tested up to 100 lbs. per sq. in. hydraulic pressure and passed as correct, a large percentage was faulty when submitted to an air test of 5 lbs. per sq. in. pressure. They preferred the niting pin to the washer on the stop-cocks, as they had found the washer apt to become slack.

They had ceased issuing both 2-light and 3-light meters. Meters were brought in and tested on receiving a complaint from the consumer. Should the meter be found correct, the cost of testing was borne by the consumer.

Domestic Water Heating by Gas

Manchester and District Juniors' Visit to Lancashire Steel Corporation, Ltd.

On Dec. 7 the Manchester and District Junior Gas Association visited the Works of the Lancashire Steel Corporation, Ltd., being welcomed by Mr. Senescall on behalf of the Management. Members of the Technical Staff of the firm conducted the visitors round the coke oven plants, the iron melting furnaces, steel works, and rolling mills.

Tea was served in the works canteen, when Mr. J. A. Thornton, Manager, joined the party.

Mr. T. H. WILLIAMS (Crewe) moved and Mr. D. BENSON (Bolton) seconded a vote of thanks to the firm and to the guides.

Mr. THORNTON, replying, expressed the hope that the members had gained knowledge. He said that rolling of steel was specialist work, and should be left to specialists to carry out. He claimed that their coke ovens were among the most modern in the country. They made 3000 tons of coke a week, and could make 5000 tons if necessary. Further, they were able to use all their surplus gas. The whole of their works had been planned with a view to dispensing with all unnecessary manual labour.

DOMESTIC WATER HEATING BY GAS.

By W. B. PAYNE, Liverpool.

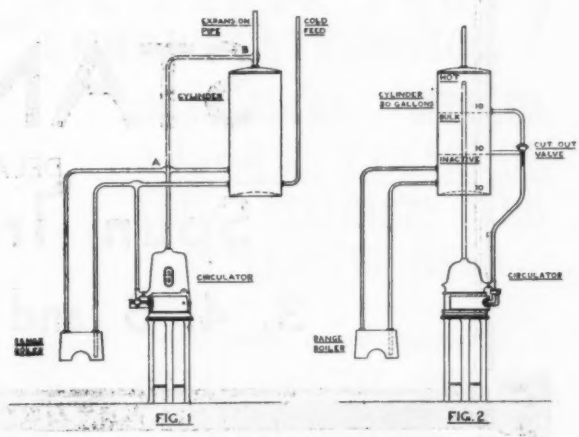
[EXTRACT.]

There are several sizes of circulator as well as types, and before installing one a careful survey of the premises should be made and the maximum demand for hot water ascertained. When this has been done the correct size of circulator can be ascertained; and only those makes with an efficient thermostat should be considered, as the economic working of the circulator depends entirely on them.

The perfect thermostat may be described as the one which can keep the supply open all the time the water is heating until the desired temperature is reached and then cut down the flow of gas promptly. Upon hot water being drawn, and cold water coming in, the gas valve should open smartly, and keep open until the desired temperature is again reached in the boiler. As the use of hot water in the average house does not exceed four hours per day, you will appreciate the need for an efficient thermostat.

In many of the older houses the cylinder is far too large for the quantity of hot water required; this difficulty, however, can be surmounted by fixing the boss on the return or cold pipe some distance from the bottom. All water below this point becomes inactive, and need not enter into your calculations. In those cases where the cylinder is in the kitchen it is to be strongly recommended that both pipes from the boiler should be connected into the cylinder, without having any connection with the range boiler pipes, and so avoid entirely the risk of inter-circulation.

In those cases where the cylinder is situated in a room overhead, a separate flow or hot water pipe must be taken direct to the storage container, as the heated water from the gas boiler will induce circulation through the back range boiler, which will operate the thermostat and so cut down the gas before the contents of the cylinder are heated. In those cases a pitcher tee may be inserted on the cold or return pipe when copper or galvanized pipes are used, and if lead pipes are used the joint can be wiped at an angle, making a common return pipe for both boilers.



Methods of Connecting Circulators.

An example of a circulator wrongly connected may be of interest. The Liverpool Gas Company received a letter requesting that a circulator, recommended and fitted by the local plumber, be removed, as it was most unsatisfactory and would not heat the water. Before acting on these instructions a call was made on the consumer, and an examination of the installation made. We discovered that the hot and cold pipes of the circulator had been connected to the hot and cold pipes of the range boiler, as shown on fig. 1 at A. It was pointed out to the consumer that the whole trouble was inter-circulation, which could be put right at a nominal cost. This was agreed to, and the hot pipe cut off from the pipe marked A, and connected to the expansion pipe marked B, which had the desired effect, and, as a consequence, the circulator was retained.

Fig. 2 indicates the ideal method of connecting a circula-

tor. Take a 30 gallon cylinder, as illustrated (which is often too large for the average household), 20 gallons of really hot water is sufficient for a bath and 10 gallons for ordinary domestic use. By an arrangement of the bosses on the cylinder, as shown, and a cut-out valve, real economies can be effected. With the valve in the upright position, 10 gallons of water will be heated for domestic use, and when the bath is required the second 10 gallons comes into operation by a movement of the valve. The 10 gallons below the bottom boss only comes into operation when the coal range is in use. It will be noted the hot pipe is connected to the top of the cylinder and outside same. I have seen many instances where the pipe has been carried up inside the cylinder. This is wrong, as the hot water still has to pass through the cold water in a metal pipe, and this is responsible for the lowering of the temperature of heated water equal to 50 ft. of pipe exposed to the air. Further, the lowering of the temperature impedes circulation.

Another type of circulator which may be adapted to an existing cylinder, where the capacity does not exceed 30 gallons, is that known as low-consumption circulator. This is connected to the cylinder with bosses in the usual way, and as the consumption is only 10 c.ft. per hour a $\frac{3}{8}$ in. gas supply pipe is all that is required. In many cases this saves capital expenditure on larger services, pipes, and meters, and owing to the small consumption no flue pipe is necessary. When the pre-determined temperature of 150° Fahr. is reached, the thermostat cuts down the gas supply to approximately 2 c.ft. per hour; and as the contents of the cylinder are heated throughout the night, the full 20 or 30 gallons is available for early morning baths. Ample hot water for other domestic requirements is also available, as these boilers will yield about 80 gallons during the 24 hours at a temperature of from 140° to 150° F. Wherever this type of heater is installed it is of the utmost importance that the whole of the cylinder and pipes be efficiently lagged.

In those premises where hot water is obtained from a boiler using solid fuel, and the hot water points are scattered, the most suitable appliance to recommend is one of the many types of geyser. As geysers are designed to raise the temperature of the water 40 degrees, it is obvious that it will take slightly longer to obtain bath water in the winter than it will in the summer, and this fact should be pointed out to the consumer.

For every home there is quite a number of heaters designed for supplying hot water to the kitchen sink. These handy little machines require little space, are automatic in action, simple to install, and provide hot water at a trifling cost. They can be attached to the wall over the sink and connected to the $\frac{3}{8}$ in. water pipe which is always close by. A screw-down water tap and a $\frac{3}{8}$ in. gas supply completes the installation, which requires no flue pipe when the consumption of gas does not exceed 10 c.ft. per hour and the ventilation is reasonably good. These machines operate by displacement. The cold water enters at the top, and is carried by a pipe to the bottom of the tank, where it forces the heated water over a funnel, and out through an open pipe at the bottom. At the same time it cools the thermostat, which increases the gas rate to heat the water ready for the next operation.

In dealing with domestic water heaters, the wash-boiler must not be overlooked, as in addition to the household wash they can be used for a number of purposes. They can be obtained in numerous sizes, with or without a draw-off tap, and finished galvanized, in colour, or in enamel.

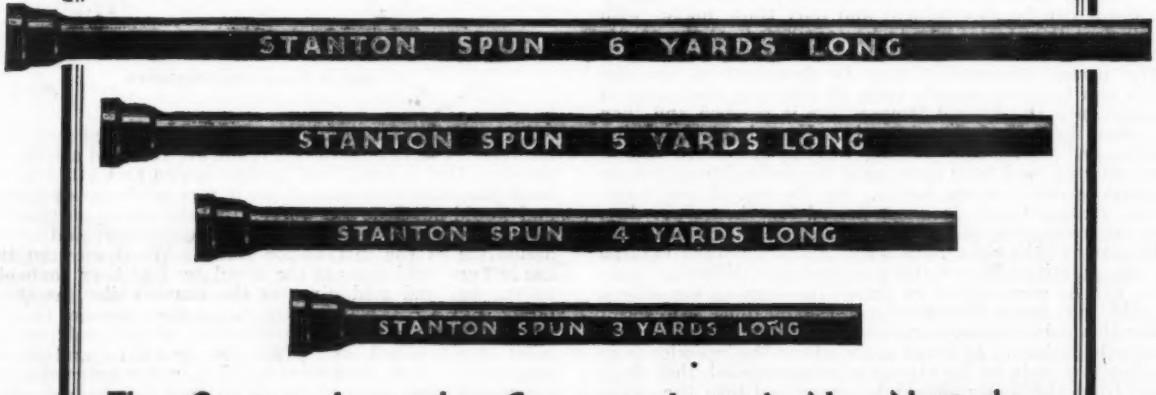
The chief points to observe when purchasing are that the area between the boiler and the outer case is ample for proper ventilation, and also that the burner is 3 in. from the bottom. These conditions are essential. Fixing is usually a very simple matter, as the cooker supply pipe is generally near at hand. If a flue pipe is added a bentee should be fixed on the rising pipe inside the building. The flue pipe should terminate with a torpedo cowl outside.

In fixing water heaters of all types it is essential to see that there is an adequate supply of gas. Both the service pipe and the meter must be of ample size to pass the required amount. It is good practice when fixing the supply pipe to the heater to lay a pipe equal in bore to the connection supplied by the manufacturers, and limit this size to a 30 ft. run, increasing same a size for every 30 ft. required in addition. The pressure taken at the heater, when burning its maximum, should never be below 20/10ths water column.

All flue pipes installed in connection with the water heaters are of the utmost importance. They must be designed to carry off the products of combustion, without in any way impairing the efficiency of the heater. It is advisable to break all flue pipes inside the building with a baffler, inverted tundish, or a bentee piece.

One of the greatest drawbacks to many types of sink

STANTON
DELAVAUD
Spun Iron Pipes
3, 4, 5 and 6 Yards Long



The Stanton Ironworks Company Limited Nr. Nottingham

heaters has been condensation, as this reduces the life of the heater, and, as you know, has many other drawbacks. This, however, has now been overcome by a very ingenious method adopted in a new heater called the "K.C.U." which has recently been placed on the market. On account of the absence of condensation the life of the heater is materialy increased, and the need for maintenance considerably reduced.

Our most serious competitor at the moment is the electric immersion heater, with a claim of 90% efficiency, while the average efficiency of gas heated appliances is 80%. Even allowing for the lower efficiency, an examination of the facts disclose that gas heated appliances are much cheaper to use than those which are electrically heated.

Discussion.

Mr. H. P. LUPTON (President) spoke of the wide experience of the author in fitting work and in dealing with the installation of various water heating appliances.

Mr. J. ALBINSON (Manchester) asked what was the thermal efficiency of the commercial type of heaters.

Mr. PAYNE said the thermal efficiency was 75 to 85%. He advised that every type of heater should be tested by the undertaking, and where an undertaking had no means of making a test, they should get the advice of another undertaking who had the necessary apparatus for making reliable tests.

Mr. H. GOODIER (Runcorn) asked if the author had seen Bell's cowl, which was made at Farnworth.

Mr. PAYNE said he had, and that it was a very good proposition.

Mr. G. W. BROUGHTON (Haslingden) asked if they had experienced any difficulty with the water undertaking in regard to the direct feed to the heaters; also as regards the complete lagging of the cylinder and taking away the airing cupboard.

Mr. PAYNE replied that they were in the hands of the Water Board, and they insisted that the supply should be taken from the feed tank, but where no feed tank was installed then a screw-down valve must be inserted near the appliance. It was an easy matter to put a coil of pipes just above the cylinder, which would meet the case of airing the household linen, &c.

Mr. N. PARTINGTON (Oldham) was glad the author had stressed the importance of suitable size of heater for each individual case, and that too large an apparatus tended to give rise to ventilation problems. He also asked what was, in the opinion of Mr. Payne, the life of the "sink" type of heater.

Mr. J. T. HAYNES (Rotherham) mentioned that water heating by gas was capable of supplying a good day load for their undertaking, and recently they had been pushing that side of their sales. They had made arrangements with the builders to provide extra connections and gas points when the houses were being built. By this arrangement the gas consumer was enabled at any time to put in apparatus at the cost of the appliance only, all other charges being absent. He regretted that the high first cost of certain type of apparatus which were otherwise excellent tended to prevent their use.

Mr. PAYNE asked who paid for this extra building and plumbing work.

Mr. HAYNES said the builder paid.

Mr. J. GRAHAM (Lancaster) said that recently they had adopted the hire-purchase system for appliances, and it was surprising what a load had been created.

Mr. D. BENSON (Bolton) asked whether the author had any experience of the General Gas Appliances Immersion Heater. With regard to the lagging of the cylinder and the "airing" of clothes, did the author think that this could be suitably done by leaving the lagging off the dome of the cylinder?

Mr. PAYNE said he regarded the type of apparatus mentioned as very good, being efficient and cheap to run. With regard to the lagging, one did not know just where to stop. It must be remembered that 50 ft. of uncovered pipe represented an extra consumption of 1 c.ft. of gas per hour. As regards the life of "sink" appliances, he thought that five years was a reasonable period. Some of the small sink water heaters had only been on the market two years, so their experience of these was not sufficient to say at the moment what the life might be.

Mr. H. W. HODGSON (Liverpool) and Mr. G. W. BROUGHTON (Haslingden) moved and seconded a vote of thanks to the author of the paper, and Mr. PAYNE briefly replied.

Diaries, Calendars, &c.

Seasonable gifts in the form of diaries, calendars, &c., have been received from the following friends, whose good wishes we heartily reciprocate:

CAMBRIAN WAGON COMPANY, LTD., East Moors Road, Cardiff.

GAS METER COMPANY, LTD., 238, Kingsland Road, London, E. 2.

KING'S PATENT AGENCY, LTD., 146A, Queen Victoria Street, London, E.C. 4.

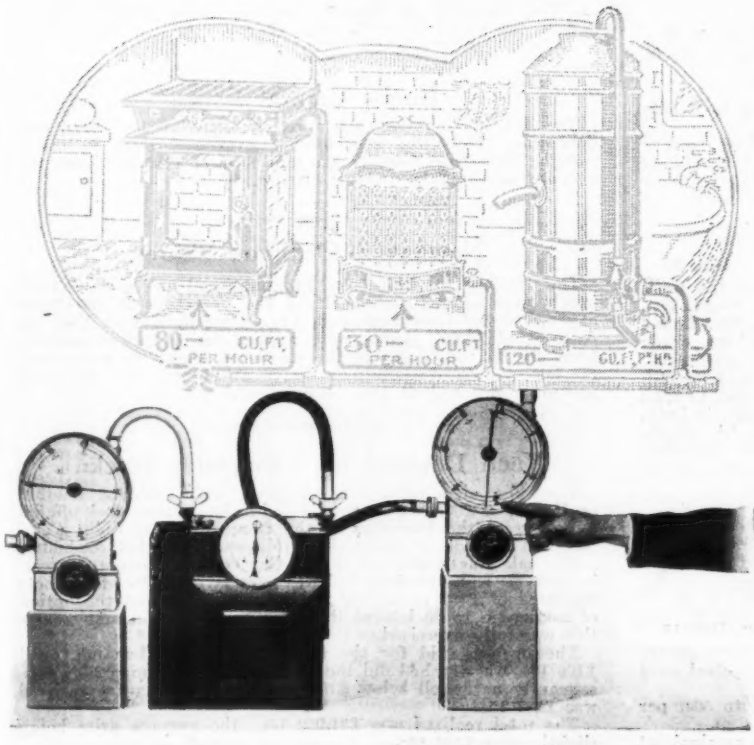
PARKINSON & COWAN, LTD., 7-17, Fitzalan Street, Kennington Road, London, S.E. 11.

STANTON IRONWORKS COMPANY, LTD., near Nottingham.

STAVELEY COAL AND IRON COMPANY, LTD., near Chesterfield.

WESTWOOD & WRIGHTS, LTD., Round Oak, Brierley Hill, Staffs.

GENTLEMEN—WE CRAVE YOUR EARNEST ATTENTION!



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YOUR DISTRICTS AND APPLIANCES NEED

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WILLEY & CO. LTD.
"Makers of everything for Gas"
EXETER & LONDON

Makers of Original Meters and Everything for Gas

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The payment of our War debt to America was duly made on Dec. 15, and, with the exception of a hardening of money rates and a slight temporary set-back in the improvement of gilt-edged securities, the general situation at home was not materially affected. The payment, however, considerably enhanced our credit abroad, which resulted in a substantial recovery in the sterling rate of exchange. Business on the Stock Exchange throughout the week was satisfactory for the time of year, and prices in most markets remained firm.

Gas stocks and shares had a good week, and with very few exceptions prices continued to show a hardening tendency, particularly among ordinaries. Inquiries for stocks which are not as a rule readily available, the quotations of which therefore have not benefited quite so much during the past few months in the large upward movement, brought about some further sharp rises. Among these were Cardiff consolidated with a gain of 8 points to 112½, and Winchester Water and Gas consolidated which advanced 7 points to 109½. A few parcels of the latter came into the market and changed hands at 110½ and 111. Other increases of note occurred in Alliance and Dublin ordinary, which hardened 3 points to 110, and Oriental ordinary with a rise of 4 points to 111½ *ex* div., while several gained from a fraction to 2 points. Falls of from 1 to 2 points were registered by a few debenture and preference stocks, and a narrowing of the margin caused a slight drop in Gas Light units.

The Sheffield Company's ordinary stock is now quoted at 109½ on the London Exchange, though the last recorded transaction on Dec. 2 was 114½. At the former price this appears to be considerably undervalued when compared with other stocks in the list paying a similar dividend, which was at the rate of 6% for 1931, and on this basis the yield at the current middle market price works out at £5 9s. 7d.%. The price on the Sheffield Exchange improved 1½ to 113½ last week, or 4 points higher than in London. The Bristol Company's 5% maximum stock at round about 105½ on the London Exchange is another attractive proposition, and here again, owing to the large local demand, the quotation on the Bristol Exchange is 3½ points higher at 109.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Dec.* 19.

There are no changes to report in the prices of tar products, which remain as follows:

Pitch is firm at 100s. per ton f.o.b.

Creosote is 3½d. to 5d. per gallon f.o.b., according to specification.

Refined tar is about 4½d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 5d.; pure benzole, about 1s. 11d. to 2s.; 95/160 solvent naphtha, about 1s. 8d.; and 90/140 pyridine bases, 3s. 9d. to 4s.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Dec. 19.

The average prices of gas-works products during the week were: Gas-works tar, 33s. to 38s. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 7½d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 5½d. to 5¾d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 4½d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2¼d. to 2¾d.; low gravity, 1¼d.; Scotland, 2¼d. to 2¾d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 1s. 6½d. to 1s. 7d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Dec.* 17.

Inquiries are more numerous, but turnover is comparatively small. In many cases deliveries are now being postponed until the New Year.

Crude gas-works tar.—The actual value is 45s. to 50s. per ton *ex* works.

Pitch.—With supplies scarce export value is nominal at 92s. 6d. to 95s. per ton f.o.b. Glasgow. Home trade quotations range from 95s. to 100s. per ton *ex* works, according to quality.

Refined tar to Ministry of Transport Specification is quiet, but value is steady at 3¾d. to 4d. per gallon f.o.r. naked.

Creosote oil is in slightly better call, but prices are easier. B.E.S.A. Specification is 3d. to 3½d. per gallon; low gravity, 2¾d. to 3¼d. per gallon; and neutral oil, 3d. to 3½d. per gallon—all *ex* works in bulk.

Cresylic acid.—Few orders are being placed and prices are irregular. Pale, 97/99 p.ct., is 11d. to 1s. per gallon; dark, 97/99 p.ct., 10d. to 11d. per gallon; and pale, 99/100 p.ct., 1s. 2d. to 1s. 3d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha is still valued at 4½d. to 5d. per gallon f.o.r., according to quantity and quality.

Solvent naphtha.—90/160 grade is 1s. 2d. to 1s. 3d. per gallon, and 90/190 grade 11d. to 1s. per gallon.

Motor benzole.—Available supplies are small, but value is unchanged at 1s. 4d. to 1s. 5d. per gallon *ex* works.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon; and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s. d.		s. d.	
Crude benzole	0 10½	to	0 11	per gallon at works
Motor "	1 6½	"	1 7	" " "
Pure "	1 10	"	1 11	" " "

Contracts Advertised To-Day.

Conveying Plant.

The Borough of Stockton-on-Tees invite tenders for coal and coke conveying plant. [Advert. on p. 814.]

Gas Oil.

The Gas Committee of the Mansfield Corporation invite tenders for the supply of gas oil. [Advert. on p. 814.]

Retort House Reconstruction.

The Borough of Stockton-on-Tees invite tenders in connection with above. [Advert. on p. 814.]

Stoking Machine.

The Borough of Stockton-on-Tees invite tenders for a stoking machine. [Advert. on p. 814.]

Rugby Capital Issue.

The Rugby Gas Company's recent issue of 4½% perpetual debenture stock was considerably over-subscribed at prices ranging from £110 down to the minimum of £105 per £100, the average price obtained being £106 8s. 4d.%.

Newhaven Ordinary Shares.

The tenders for the 5000 £1 additional ordinary shares, which were offered on behalf of the Directors of the Newhaven Gas and Coke Company, Ltd., were opened on Dec. 14. A total of 12,067 shares were applied for at prices ranging from £1 12s. 6d. down to the minimum of £1 9s. per share, the lowest to secure allotment being at £1 11s., and the average price obtained £1 11s. 7d. per share.

Keen Demand for Gloucester Stock.

Very keen demand was experienced at the sale by auction on Dec. 16 of £30,000 5% consolidated ordinary new stock offered by order of the Directors of the Gloucester Gas Light Company. The whole of the stock was disposed of in half an hour.

The sale was conducted at the Gas Offices, Eastgate Street, by Mr. E. J. J. Randall, and was very largely attended. Lots consisted of £100 each, and purchasers were given the option of taking up to 20 lots at the same price, and in many cases this was fully exercised.

The opening bid for the first lot was £96, but not until £106 10s. was reached did the hammer fall. Opening bids subsequently never fell below £105, and the highest price realized was £107 15s.

The total realized was £31,952 15s., the average price being slightly over £106 10s.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier pages.]

Issue	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Dec. 17. (Provincial Exchange Dec. 16.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Oct. 8	7⅞	7⅞	Alliance & Dublin Ord. ...	105—115	+3	112—112¼
374,000	,,	July 4	4	4	Do. 4 p.c. Deb. ...	80—90	...	...
557,655	,,	Aug. 22	7	7	Barnet Ord. 7 p.c.	132—142	...	...
300,000	1	Oct. 17	1/9⅜	1/4⅜	Bombay, Ltd.	21/6—23/6	...	23/3
177,750	Stk.	Aug. 22	9	9¼	Bournemouth sliding scale	195—205	...	202—202½
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	145—155	...	152—152½
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	135—140	...	...
50,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	75—80	...	...
163,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	100—105	...	101½—102½
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	120—125	−2	123—124
357,900	,,	Aug. 22	7½	7½	Brighton, &c. 6 p.c. Con. ...	142—147	+1	145—146
540,000	,,	,,	6½	6½	Do. 5 p.c. Con. ...	127—132	...	...
195,500	,,	,,	6	6	Do. 6 p.c. B Pref.	135—145	...	...
1,387,500	,,	Aug. 8	5	5	Bristol 5 p.c. max.	108—110[a]	...	...
120,420	,,	June 20	4	4	Do. 1st 4 p.c. Deb. ...	96—99[a]	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	95—98[a]	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	115—120[a]	...	...
855,000	,,	Oct. 3	8	7	British Ord.	142—147	...	145½—147
100,000	,,	June 20	7	7	Do. 7 p.c. Pref.	140—150	...	...
350,000	,,	—	—	—	Do. 5½ p.c. Pref. ...	107—112	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	90—95	...	95
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	...
160,000	,,	July 4	5	5	Cambridge 5 p.c. Deb. ...	117—122	...	...
100,000	10	Dec. 5	6	6	Cape Town, Ltd.	7½—8½*	+½	7⅞—8
100,000	10	Nov. 7	4½	4½	Do. 4½ p.c. Pref. ...	6—7*	...	...
150,000	Stk.	June 20	4½	4½	Do. 4½ p.c. Deb. ...	90—95	...	...
626,860	,,	Aug. 8	6	6	Cardiff Con. Ord.	110—115	+8	...
237,860	,,	July 4	2½	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	,,	Aug. 8	6½	6	Chester 5 p.c. Ord.	93—98[b]	...	...
99,986	1	Oct. 17	2/-	2/-	Colombo, Ltd. Ord. ...	25/—30/-	...	...
609,204	1	Oct. 17	-/10'90	-/11'47	Colonial Gas Assn. Ltd. Ord.	16/—18/-	−1/-	...
396,053	1	,,	1/2'54	1/3'30	Do. 8 p.c. Pref.	19/6 - 21/6	+-/6	21/1½
1,822,505	Stk.	Aug. 8	5½	5	Commercial Ord.	104—109	...	...
475,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	74—79	...	...
240,744	,,	—	—	—	Do. 5 p.c. Deb. ...	117—122	−2	118—119½
807,560	,,	Aug. 8	7	7	Croydon sliding scale ...	139—144	...	...
469,590	,,	,,	5	5	Do. max. div.	95—100	...	99
500,000	,,	July 4	5	5	Do. 5 p.c. Deb.	120—125	...	...
642,270	,,	Aug. 8	10	7	Derby Con.	150—160[e]	...	...
55,000	,,	July 4	4	4	Do. 4 p.c. Deb.	75—85[c]	...	...
209,000	,,	Sept. 5	5	5	East Hull Ord. 5 p.c. ...	97—102	...	...
179,500	,,	Aug. 22	5½	6	East Surrey Ord. 5 p.c. ...	110—120	+2	...
155,019	,,	June 20	5	5	Do. 5 p.c. Deb. ...	118—123	...	...
1,009,180	,,	Sept 19	16½	15	European, Ltd.	122—127	...	...
19,405,992	,,	Aug. 8	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	24/3—25/3[f]	−/3	24/4½—25/0½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. ...	80—85	...	82½—83½
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	98—101	...	98½—99½
6,102,497	,,	June 20	3	3	Do. 3 p.c. Con. Deb. ...	78—82	−1	78½—80
8,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	114—117	+2	115½—116
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	108—112	...	109½—111
264,011	,,	Aug. 22	—	6	Harrogate New Cons. ...	110—115	...	...
82,500	,,	Aug. 22	7	7	Hastings & St. L. 5 p.c. Conv.	130—140	...	...
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	102—107	...	...
70,000	10	Oct. 17	†10	†10	Hongkong & China, Ltd. ...	9¼ - 10⅛	...	...
219,200	Stk.	Aug. 22	6	6	Hornsey Con. 3½ p.c. ...	117—122	...	...
5,600,000	,,	Nov. 21	14	10	Imperial Continental Cap.	198—208	...	200—203
223,130	,,	Aug. 8	3½	3½	Do. 3½ p.c. Red. Deb.	90—95	...	...
286,242	,,	Aug. 8	8½	8½	Lea Bridge 5 p.c. Ord. ...	152—162	...	157½—160
2,145,907	,,	Aug. 22	6	6	Liverpool 5 p.c. Ord. ...	119—120[b]	+½	...
245,500	,,	June 20	5	5	Do. 5 p.c. Red. Pref. ...	100—110[b]	...	...
306,083	,,	July 15	4	4	Do. 4 p.c. Deb. ...	100—102	...	...
165,736	,,	Sept. 5	10	8	Maidstone 5 p.c. Cap. ...	160—170	...	...
56,176	,,	June 20	3	3	Do. 3 p.c. Deb. ...	69—74	...	...
75,000	5	Dec. 5	†10	†10	Malta & Mediterranean ...	7½ - 8½*	...	...
892,000	—	Oct. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	97—102	...	...
171,978	Stk.	Sept. 5	5	5	M. S. Utility "C." Cons. ...	100—110	...	...
718,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	90—95	...	90½—91½
112,126	,,	July 4	4	4	Do. 4 p.c. Deb. ...	95—100	...	97½—98
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
675,000	,,	21 May '31	16	16	Montevideo, Ltd.	35—45	...	...
2,061,315	,,	Aug. 8	5½	5	Newcastle & Gateshead Con.	22/6—23/6[d]	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	91—93[d]	...	...
691,705	,,	June 20	3½	3½	Do. 3½ p.c. Deb. ...	89—91[d]	...	...
277,285	,,	Nov. 7	5	5	Do. 5 p.c. Deb. '43...	103—107[d]	...	...
274,000	,,	Aug. 8	5	5	Newport (Mon.) 5 p.c. max.	93—95[a]	...	...
199,940	,,	Aug. 22	7½	7½	North Middlesex 6 p.c. Con.	135—145	...	...
896,160	,,	Aug. 8	5	5	Northampton 5 p.c. max. ...	96—101	...	...
300,000	,,	Dec. 5	7	9	Oriental, Ltd.	109—114*	+4	109
205,162	,,	June 20	8	8	Plym'th & Stonehouse 8 p.c.	143—153	...	...
504,416	,,	Aug. 22	8	8	Portsm'th Con. Stk. 4 p.c. Std.	150—160	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	97—102	...	...
114,000	,,	Aug. 8	5	5	Preston 5 p.c. Pref.	105—110	...	...
686,312	,,	July 18	4	4	Primitiva 4 p.c. Rd. Db. 1911	77—82	...	...
889,813	,,	June 20	4	4	Do. 4 p.c. Cons. Deb.	77—82	...	80—81
150,000	10	Sept. 19	6	6	San Paulo 6 p.c. Pref. ...	6⅝—7¼	...	...
1,736,963	Stk.	Sept. 5	6	6	Sheffield Cons.	112—115[e]	+1½	...
95,000	,,	July 18	4	4	Do. 4 p.c. Deb.	92—96[e]	...	...
133,201	,,	Sept. 5	5	2½	Shrewsbury 5 p.c. Ord. ...	118—123	...	...
90,000	10	June 6	15	15	South African	4—6	...	...
6,709,895	Stk.	Aug. 8	7	6	South Met. Ord.	120—125	...	121½—123
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. 1'f.	138—143	...	139½
1,895,445	,,	July 4	3	3	Do. 3 p.c. Deb. ...	78—82	−½	78½—81
1,009,000	,,	July 18	4	5	Do. 5 p.c. Red. Deb.	109—114	...	...
91,500	,,	Aug. 8	8½	8½	South Shields Con.	140—145[d]	...	...
1,543,795	,,	Aug. 8	6	6	South Suburban Ord. 5 p.c.	118—123	...	120—123
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	113—118	...	114
668,837	,,	June 20	5	5	Do. 5 p.c. Deb.	120—125	...	122½
647,740	,,	Aug. 22	5	5	Southampt'n Ord. 5 p.c. max.	102—107	+1	...
121,275	,,	June 20	4	4	Do. 4 p.c. Deb.	95—100	...	...
350,000	,,	Aug. 8	—	2/-	Swansea 5½ p.c. Red. Pref.	110—114	...	1/8
200,000	,,	June 20	6½	6½	Do. 6½ p.c. Red. Deb.	105—110	...	...
1,076,490	,,	Aug. 8	6⅝	6⅝	Tottenham and District Ord.	131—136	...	132½—135
300,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	120—125	...	121—123½
199,005	,,	June 20	4	4	Do. 4 p.c. Deb. ...	95—100	...	99½
85,701	,,	Sept. 19	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	67—72	...	...
346,069	,,	Aug. 22	7	7	Uxbridge, &c., 5 p.ct. ...	130—140	...	...
88,880	,,	,,	5	5	Do. 5 p.c. Pref. ...	112—117	...	...
1,322,220	,,	July 4	7	7	Wandsworth Consolidated	137—142	+1	140—142½
1,096,373	,,	,,	5	5	Do. 5 p.c. Pref.	113—118	−2	113—116
1,317,964	,,	June 20	5	5	Do. 5 p.c. Deb.	118—123	...	118—122
158,400	,,	Aug. 22	6g	5	Winchester W.&G. 5p.c. Con.	107—112	+7	110½—111

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g* Paid £3, including 10s. on account of back dividends. *Ex. div. † Paid free of income-tax. ‡ For year.

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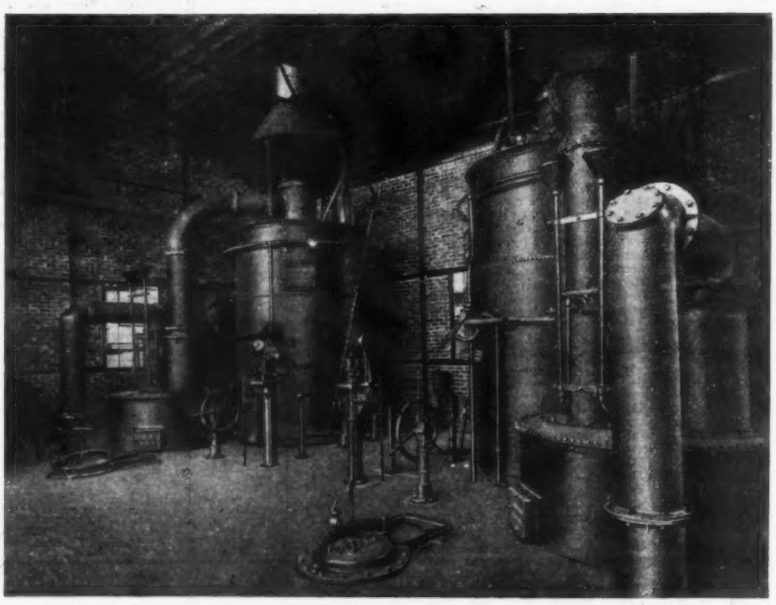

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